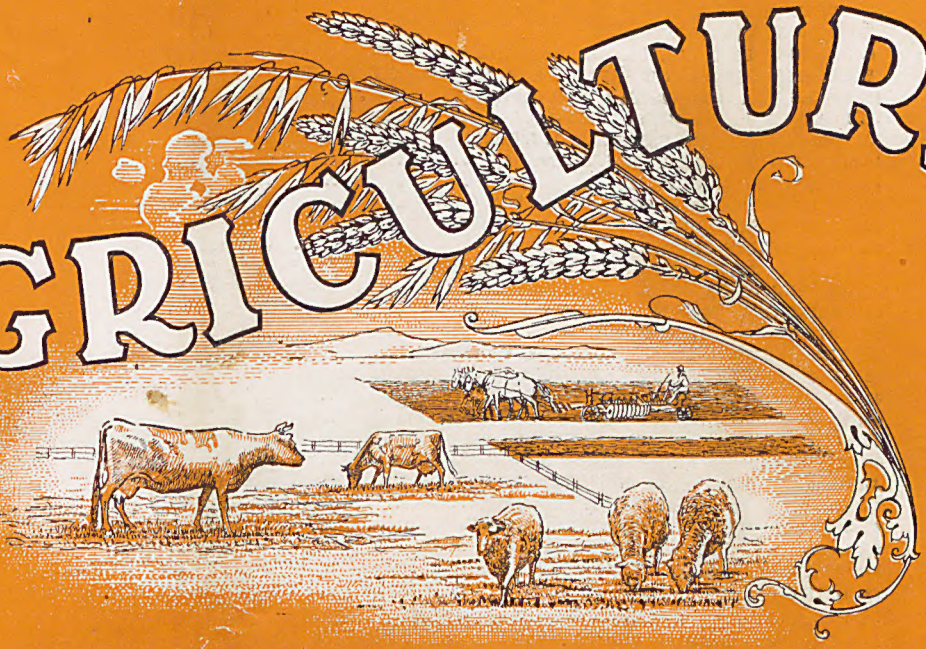
VOL. XXIX. [Registered at the General Post Office, Melbourne, for transmission by Post as a Newspaper.] PART 4.

THE JOURNAL OF THE DEPARTMENT OF AGRICULTURE OF VICTORIA, AUSTRALIA.



APRIL, 1931. PRICE, THREEPENCE

BULLETINS.

(New Series.)

Obtainable from the Director of Agriculture, Melbourne.

(PRICE:— Threepence (3d.) per copy—postage extra.)

No.	*Name of Bulletin.*	*Postage*
3.	APPLE GROWING FOR EXPORT. P. J. Carmody.	1d.
5.	CIDER MAKING. J. Knight.	2d.
6.	PASSION FRUIT CULTURE IN VICTORIA. J. Farrell.	2d.
8.	BUILDING HINTS FOR SETTLERS. A. S. Kenyon, C.E., and others.	2d.
13.	CHEESE MAKING (Cheddar). C. S. Sawers.	1d.
14.	FARM BLACKSMITHING. G. Baxter.	2d.
15.	BROOM FIBRE INDUSTRY. T. A. J. Smith.	1d.
16.	THE PIG INDUSTRY. R. T. Archer.	2d.*
19.	LIME IN AGRICULTURE	3d.
26.	TOMATO CULTURE IN VICTORIA. S. A. Cock.	1d.
27.	SUMMER FODDER CROPS. Temple A. J. Smith.	1d.
30.	SMALL FRUIT CULTURE. A. A. Hammond.	2d.
32.	CITRUS CULTURE IN VICTORIA. S. A Cock.	2d.†
35.	SUMMER BUD OR YEMA GRAFT OF THE VINE. F. de Castella	1d.
38.	SPRING GRAFTING OF THE VINE. F. de Castella.	2d.
39.	POTATO CULTURE. J. T. Ramsay.	2d.†
40.	THE BEET SUGAR INDUSTRY. W. L. Williams.	2d.
42.	ANTHRACNOSE, or BLACK SPOT OF THE VINE. F. de Castella.	2d.
43.	BOTTLING AND DRYING OF FRUIT, &c. Miss A. Knight.	1d.†
44.	PEACH GROWING IN VICTORIA. A. G. McCalman	2d.
45.	SILO CONSTRUCTION AND MAKING OF SILAGE.	1d.
46.	ONION PRODUCTION IN VICTORIA. S. G. Harris.	1d.
47.	STANDARDIZED PACKING OF FRUIT FOR EXPORT. Basil Krone.	1d.
48.	CASSE. F. de Castella.	2d.
49.	DOWNY MILDEW OF THE VINE. F. de Castella.	2d.
50.	OIDIUM OF THE VINE. F. de Castella.	2d.
51.	CURING OF HIDES. J. C. Marshall.	1d.
52.	DAIRY FARMING IN VICTORIA.	1d.†
53.	PRODUCTION AND FLUE CURING OF TOBACCO. Temple A. J. Smith and G. E. Marks.	2d.*
54.	POULTRY FARMING.	2d.†
56.	APRICOT GROWING IN VICTORIA. W. H. Nicholls.	2d.
58.	PLANTING FRUIT TREES FOR INTER-POLLINATION.	1d.
59.	AIDS TO SELECTION OF RAMS. N. A. Bowman	2d.
60.	FARM GARDEN	1d.
61.	HELPFUL HINTS TO SHEEPMEN. N. A. Bowman.	1d.
62.	HARVESTING AND PACKING OF PASSION FRUIT. B. Krone.	2d.
63.	BUDDING, GRAFTING AND INARCHING OF FRUIT TREES. J. M. Ward.	2d.
64.	EXPORT OF APPLES. J. M. Ward and Basil P. Krone.	2d.

* For postage to places beyond the Commonwealth, 3d. per copy extra.
† For postage to places beyond the Commonwealth, 2d. per copy extra.

PAMPHLETS (FREE)

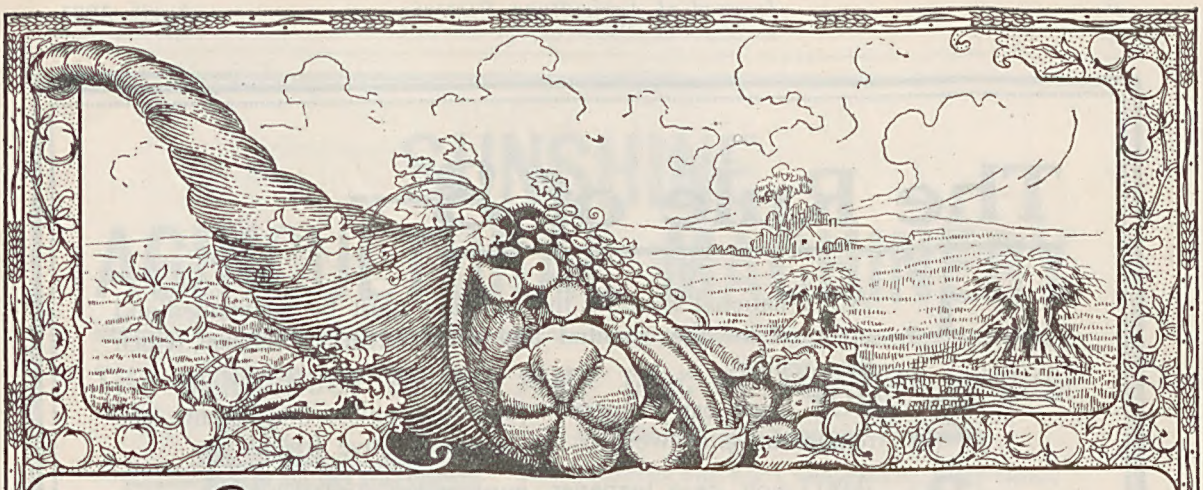
Bee-Keeping (Making of Hives); Foul Brood in Bees and Transferring Bees; Feeding Cows for Milk Production; Home Butter-Making; Milk Fever; Contagious Abortion; Actinomycosis; Infectious Eye Disease of Stock; Calf Rearing; Farm Bookkeeping; Sulphiting; Some Vintage Considerations; Spring Frosts; Sweet Wines of Moderate Alcoholic Strength; Twenty Years of Reconstitution (Vineyards); Pruning the Ohanez and some other "Shybearing" Vines; Preliminary Maceration; Home Wine Making; Resistant Stocks; Manuring of Vines; Vineyard Tillage; Mealy Bug; Transit Rot; Control of Woolly Aphis; Cut Worms; Orchard Pests and Control Measures; Flax Growing; Cultivation of Maize; Millet; Lucerne; Sudan Grass; Subterranean Clover; Improvement of Soil Texture; Summer Fallowing; Fallowing for Wheat; Wheat Pickling Methods; Top Dressing Pastures; Irrigated Pastures; Swine Fever; Sheep Blow-Fly; Worms in Sheep; Sheep Nasal Bot; Lip and Leg Ulceration of Sheep; Black Disease of Sheep; Liver Fluke Disease; Foot Rot; Lamb Marking; Poultry Housing; Poultry Parasites; Poultry on Dairy Farms; Back-Yard Poultry Keeping; Poultry Feeding; Chick Rearing; Poultry Tick; Home-Made Brooders; Avian Tuberculosis; Chicken Pox; Rearing Chickens on the Colony System; Eggs and Marketing; The Caponizing of Cockerels; Coccidiosis in the Fowl; Influenza in Horses.

REPORT (FREE)

AGRICULTURAL EDUCATION AND AGRICULTURAL DEVELOPMENT IN AMERICA. A. E. V. Richardson.

HANDBOOK OF VITICULTURE (Free).

NATIONAL MUSEUM OF VICTORIA



Contents. APRIL, 1931.

		PAGE
Pasture Management—Top-dressing with Artificial Fertilizers	*H. A. Mullett, B.Ag.Sc.*	161
Stallion Register 1930–31 (List of Stallions refused certification but which owners may retain for breeding purposes with owners' own mares)	.. ..	169
Seeding the Wheat Crop	*W. B. Miller, M.Ag.Sc.*	170
The Oriental Peach Moth	*R. T. M. Pescott, M.Ag.Sc.*	173
The Orchard Green Crop	*Frank M. Read, M.Ag.Sc.*	177
Dairy Buildings—Plans and Specifications	*J. M. Kerr*	180
Export of Citrus Fruit—Committee's Recommendations		189
Potato Manurial Trials	*J. T. Ramsay*	192
Orchard and Garden Notes	*E. E. Pescott, F.L.S.*	199
Professional Papers—		
Experiments on the Control of "Stinking" Smut or Bunt	*R. L. Twentyman, B.Ag.Sc.*	201
Rose Diseases and their Control	*B. J. Grieve, M.Sc.*	209

Issued under the direction of the Hon. W. Slater, M.L.A., Minister of Agriculture.

COPYRIGHT PROVISIONS AND SUBSCRIPTION RATES.

The Articles in the Journal of the Department of Agriculture of Victoria are protected by the provisions of the Copyright Act. Proprietors of newspapers wishing to republish any matter are at liberty to do so, *provided the Journal and author are both acknowledged.*

The Journal is issued monthly. The subscription, which is payable in advance and includes postage, is 3s. per annum for the Commonwealth and New Zealand, and 5s. for the United Kingdom and Foreign Countries. Single copy, Threepence. Subscriptions should be forwarded to the Director of Agriculture, Melbourne.

The Rule of 3—

1. AS a national concern, the railways must be maintained and operated for the essential and often exclusive services which they render.

2. BUT they can't operate profitably unless they secure the remunerative as well as the unremunerative freight.

3. AND you, as a taxpayer, must make good the losses which are incurred when high-graded freight is sent by road instead of by rail.

Which means that —

You'll have to carry the Railways if the Railways don't carry you—and ALL your Goods ALWAYS

INDEX TO ADVERTISEMENTS

FRONT SECTION

Alston, J. & Sons vi
Cockbill, J. vi
Cooper's Alboleum and Arsinette.. .. v
Gerrard Wire-Tying Machines ix
Harper, Robt. & Coy. Ltd. viii
International Harvester Coy. x
Leggo & Farmers Ltd. iv
McKay Massey Harris Pty. Ltd. . .. iii
Nitrogen Fertilizers Pty. Ltd. vii
Robinson, T. & Co. Pty. Ltd. ix
Rylands Bros. (Aust.) Ltd. iv
Victorian Railways ii
Wells, W., Dairy Machinery Specialist .. vi

BACK SECTION

Dandy Poultry Food xviii
Danks, John & Son xvii
Ford Motor Coy. of Australia xiii
Gippsland and Northern Seeds xix
Hazeldale Jersey Sale xviii
Law, Somner Pty. Ltd. xvi
Lysaght Bros. & Coy. xiv
National Trustees Executors & Agency Coy. xvi
Red Polls for Sale xvi
Shell Company of Australia xi
State Savings Bank xiv
Texaco Kerosene xv
Trewhella Bros. Pty. Ltd. xi
Trustees Executors & Agency Coy. .. xvii
Wood, E., Pty. Ltd. xi
Wunderlich xii
Yates, Arthur & Coy. xx

SUNSHINE AGRICULTURAL MACHINERY

THE SUNDERCUT STUMP JUMP DISC CULTIVATING PLOUGH

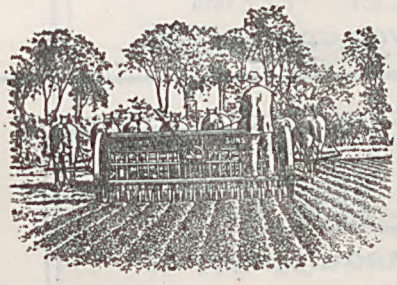
Unequalled for Summer Fallowing

Deals effectively with heavy weed growth, paddy-melon, stinkwort, &c. Alternate 20-inch and 18-inch discs, set with undercut, cut a level bottom, and leave a lumpy tilth ideal for moisture conservation.

10-Disc size cultivates 5 feet.
14-Disc size cultivates 7 feet.

Supplied with levers either for team or tractor pull.

THE SUNTYNE COMBINED GRAIN AND FERTILIZER DRILL AND SPRING TYNE CULTIVATOR



SIZES SUPPLIED:

8	Row	..	17	Tynes	..	Cultivating 5	feet
12	,,	..	25	,,	..	,, 7¼	,,
14	,,	..	29	,,	..	,, 8½	,,
16	,,	..	33	,,	..	,, 9½	,,
20	,,	..	41	,,	..	,, 12	,,
24	,,	..	49	,,	..	,, 14	,,

Sows as shallow or deep as desired, on a level compacted seed bed, where full advantage is secured from the stored moisture in the soil. Flexible floats save tyne breakages. All-Steel Lid keeps seed and super. dry. Forward lever and hitch available for tractor use.

THE SUNBOW STUMP JUMP DISC PLOUGH

Has great clearance—14½ inches from disc to disc. Exceptionally high jump, with minimum of draught. Double rear wheel gives stability. Discs are 23 inches in diameter. Cuts furrows 7 inches wide. Made in 3, 4, 5, and 6 furrow sizes with levers for either team or tractor pull.

Write for descriptive pamphlets and particulars of prices and terms

H. V. McKAY MASSEY HARRIS PTY. LTD.

(SUNSHINE SECTION)

Sunshine Harvester Works, Sunshine

MELBOURNE SHOWROOMS · 664 BOURKE STREET WEST

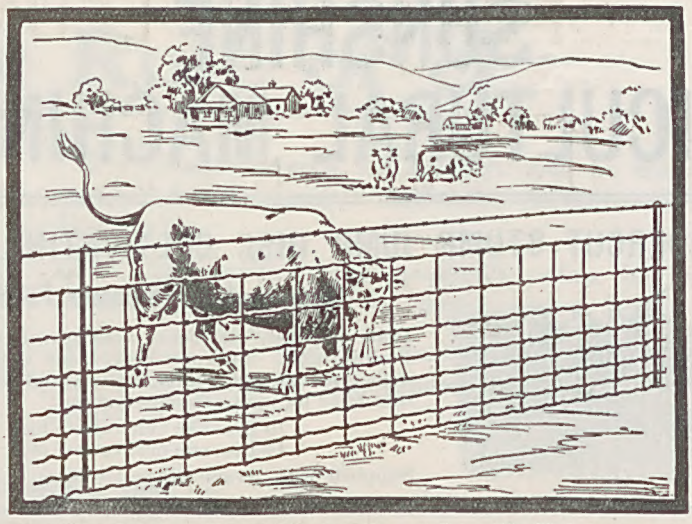
"HUH! IT'S 'WARATAH'!"

SOLVES SETTLERS' PROBLEMS

IT IS—

FIRE PROOF
RUST PROOF
WHITE ANT PROOF
CATTLE PROOF
SHEEP PROOF
PIG PROOF

Erection Costs are Low—
Maintenance Costs are Nil



Made in Three Types :

(All heavily galvanized)

SPECIAL HEAVY
Med. Temper Steel Wire

TYEASY HIGH TENSILE
High Carbon Steel —light, cheap, strong.

STANDARD
Medium Tempered

The "WARATAH" FENCE ("Hinged Joint") Made in Australia—For Australians —By Australians

RYLANDS BROS. (Aust.) Ltd. NEWCASTLE N.S.W.
and at 422 Little Collins Street, Melbourne, C.1. Tel. C.7870

From the Finest B.H.P. NEWCASTLE STEEL

"ANTI-BUNT"

a copper carbonate of 95-100% purity

Pickling seed grain with Copper Carbonate ("Anti-Bunt") has been adopted by the greatest wheat-growing countries in the world. . . . "Anti-Bunt" is unexcelled for quality and fineness and assures a high percentage of seed germination. Use "Anti-Bunt" this season.

VICTOR LEGGO & FARMERS LTD.

218-222 QUEEN STREET, MELBOURNE

SYDNEY BRISBANE

Agents all States

COOPER'S ALBOLEUM

(White Oil Emulsion)

FOR CONTROL OF SCALE AND INSECT PESTS

ON TREES IN LEAF

FOR SAFETY AND EFFICIENCY

COOPER'S ALBOLEUM IS UNSURPASSED BY ANY OTHER SPRAYING OIL

ALBOLEUM CONTROLS RED SPIDER

Obtainable in { 5-gallon Drums / 2-gallon Tins

Used in conjunction with Arsenate of Lead, Alboleum gives additional control of Codling Moth

---

THE WORLD'S BEST ARSENATE OF LEAD

IS

COOPER'S ARSINETTE

THE SUPERIORITY OF ARSINETTE LIES IN—

1.—ITS GUARANTEED 30% AS_2O_5 CONTENT
2.—ITS EXTRAORDINARY FINENESS
3.—ITS EVEN COVERING POWER
4.—ITS TENACIOUS STICKING QUALITY

Obtainable in { 56-lb. Cases (14 4-lb. packets) / 25-lb. Containers

Alboleum and Arsinette are Made in Australia

by

WILLIAM COOPER & NEPHEWS (Australia) Limited

4 O'CONNELL STREET, SYDNEY

Distributors for Victoria :

COOPER ENGINEERING Co. LTD.

542-546 LITTLE BOURKE ST., MELBOURNE, C.1.

A Trio of High-Grade Products for the Poultry Farm!

COCKBILL'S **MEAT MEAL** — Highest in Feeding Values

COCKBILL'S **BONE GRIT** — 100 % Bone

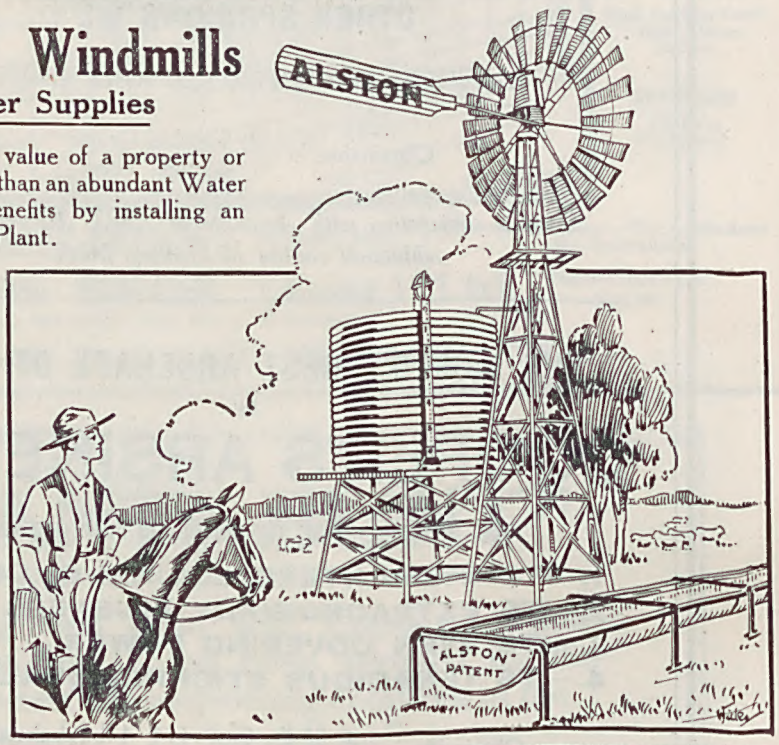
COCKBILL'S **BONE MEAL** — A Finer Bone, suitable for Chicks

COCKBILL'S BLOOD AND BONE MANURE
Stands alone for Flower Garden, Vegetable Garden, and Lawn

Samples on request to **J. COCKBILL,** 407 Post Office Place, Melbourne 'Phone Central 2098

"ALSTON" Windmills
For all Water Supplies

Nothing adds more to the value of a property or the comfort of a homestead than an abundant Water Supply. Secure these benefits by installing an "ALSTON" Windmill Plant.



"ALSTON" Mills will run many months without attention, the lubrication and speed regulation are entirely automatic, doing away with worry and anxiety. The gears are machine-cut and run in oil, and working parts are all enclosed, ensuring ample protection and long life, together with very easy running.

And now
Prices have been reduced
offering still further inducements to install these famous Windmills.

Send for new 130-page Catalogue

James Alston & Sons
Pty. Ltd.
Queens Bridge, Sth. Melbourne
S.C. 4

CLINCH TATTOO

The newest scientific invention for tattooing all kinds of stock.

PERMANENT QUICK
SAFE ——— SURE

Special Tattoo for Rabbits.

New Tattoo for branding pigs on the back.

Send for full range of leaflets, catalogues, &c.

SPECIAL OFFER
to Bona-fide Purchasers

I am prepared, for a period of one month, to forward a CLINCH TATTOO fitted with the needle with the patented eye for TEST against any other instrument manufactured, and if the CLINCH is not superior, I will pay return postage.

'Phone J 4280

W. WELLS, Dairy Machinery Specialist, 14-16 Willis St., Richmond, E.1, Vic.

GREATER PROFITS *from* PASTURES

The provision of feed for the Winter months is now receiving the consideration of the stockowner. Those who wish to take advantage of the latest methods of pasture management and manuring for Winter grass should try applications of Sulphate of Ammonia and Superphosphate combined with ROTATIONAL GRAZING during the coming Autumn and Winter. The following points are essential for success:—

A.—PASTURES MUST CONTAIN AMPLE WINTER-GROWING GRASSES, e.g., Perennial Ryegrass, Wimmera Rye, Cocksfoot, &c.

B.—AUTUMN APPLICATION OF SULPHATE OF AMMONIA AND SUPERPHOSPHATE. 1 cwt. Sulphate of Ammonia plus 1 to 2 cwt. Super. per acre in April or May *after* the soil has been well saturated by Autumn rains.

C.—APPLY WHEN GRASS IS GRAZED SHORT AND IS DRY.

D.—FOR EARLY SPRING GRASS, 1 to 1½ cwt. Sulphate of Ammonia per acre should be applied in July.

For further particulars apply

ADVISORY OFFICER,

NITROGEN FERTILIZERS Pty. Ltd.

360 COLLINS STREET, MELBOURNE, C.1

A SPECIAL MESSAGE

TO

THE DAIRY FARMERS AND PIG BREEDERS OF VICTORIA

Robert Harper and Company Limited
Melbourne

CAN OFFER YOU

"STAR" CALF FOOD

Manufactured from Linseed, Maize, Oatmeal, Rice, and Barley
The best food offering in Australia for Calves

HARPER'S RICEMEAL

Recommended as an ideal Pig Food on account of its Fat content

SPLIT PEA SCREENINGS
BARLEY BRANNING
OAT BRANNING
OAT HULLS

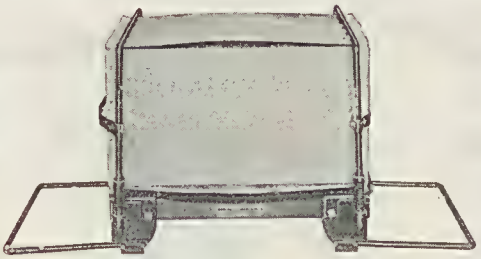
Constant and regular supplies available
Samples and Prices on application through your Local Storekeeper

THE ADECO LID PRESS

With Improved Compensating Arms, which provide for variations in size of shooks

For

Standard Cases	.. £3 17 6
Dump Cases ..	.. £3 17 6
Long Flat Bushels	.. £4 10 0
Combination for Standards and Dumps	£4 7 6



CHEAP
but
EFFECTIVE

GERRARD WIRE-TYING MACHINES Co. Pty. Ltd. - Melbourne, Sydney, Brisbane, Adelaide, Perth

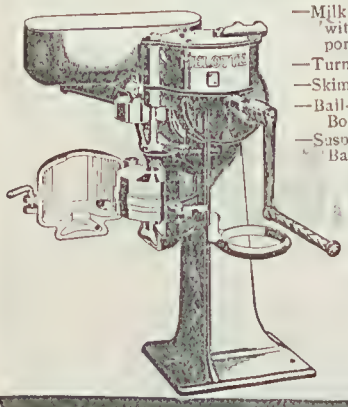
Farm Relief

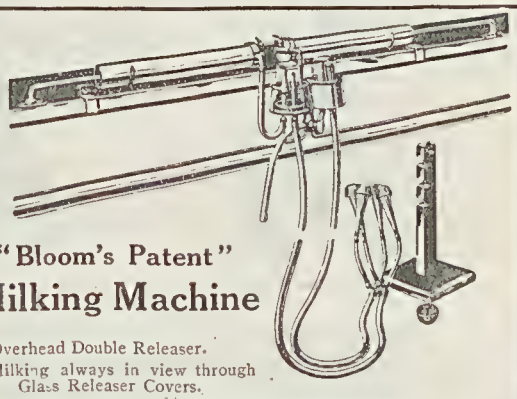
More Profit — Less Work

We want every Dairyman who reads this advertisement to send for prices and particulars of these two machines. Both are entirely New Models, Money-savers and Money-makers.

New Low Model "Melotte" Separator

—Low! only waist high. No high lifting.
—Bowl Chamber of snowy white porcelain.
—Milk Vat lined with snowy white porcelain.
—Turns Easier.
—Skims Cleaner.
—Ball-Bearing Bowl-Bearing.
—Suspended Bowl Balances always.





"Bloom's Patent" Milking Machine

—Overhead Double Releaser.
—Milking always in view through Glass Releaser Covers.
—Divided Claw milks two teats alternately, therefore more natural and faster. No dangerous inflations.
—Simple, Easy to Clean, and most sanitary made.
—Nothing to go wrong. Children can operate it.

2 H.P. Engine will operate 3 or 4 Unit Milker and Separator.

Send for Illustrated Pamphlets TO-DAY—Post Free. An inquiry places you under no obligation.

T. ROBINSON & Co. Pty. Ltd. Spotswood

and at BURWOOD, N.S.W. City Showrooms, 536-8 Bourke St., Melbourne

This Journal

offers exceptional advantages

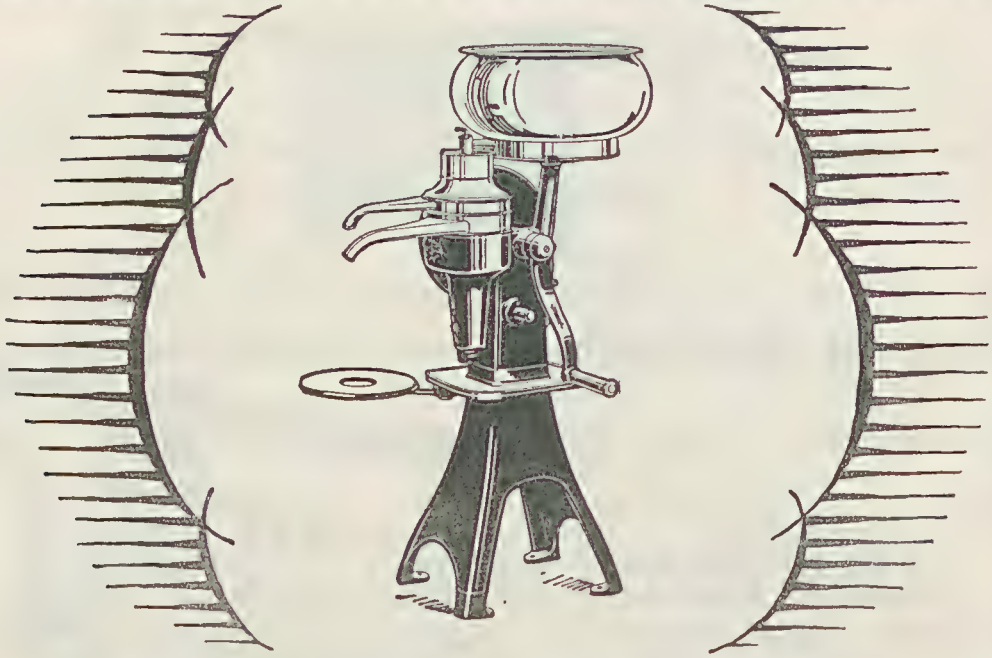
for Advertising

Circulates throughout the Country Districts of Victoria and amongst Farmers of the Commonwealth, reaching also country professional men, tradesmen, schoolmasters, teachers, and the like.

Exceptionally satisfactory results have followed the advertising of Stud Stock in this Journal.

Rates on application to the Official Canvasser

DEPARTMENT OF AGRICULTURE, MELBOURNE, C.2



EVERYTHING YOU WANT

In a Separator is in the

McCORMICK-DEERING

EVERYTHING you want—easy turning, clean skimming, long life—appearance, efficiency, cleanliness—they are all here in the McCormick-Deering—the Ball-Bearing Cream Separator that is setting new standards in cream separating all over Australia. Examine its features. Turn the handle. Put it to any test you like and you will soon realize why dairy farmers—and their families too—have unanimously voted the McCormick-Deering the world's greatest separator value. Ask your neighbours about it—ask the leading dairymen in your district—and they will tell you that when it comes to a question of efficiency, long life, close skimming, easy turning, or beauty, the McCormick-Deering Ball-Bearing Cream Separator stands alone in their estimation. The McCormick-Deering local agent will be pleased to demonstrate this modern cream separator to you or to give you full particulars. Be sure you drop in and see him when next in town, or write us direct.

INTERNATIONAL HARVESTER COMPANY OF AUSTRALIA PTY. LTD.

543-555 Bourke Street, Melbourne, C. 1

NATIONAL MUSEUM OF VICTORIA

The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

Pasture Management

Top-dressing with Artificial Fertilizers

Being portion of an address on Pasture Management delivered at the Annual Convention of the Chamber of Agriculture by Mr. H. A. Mallett, B.Ag.Sc., Agricultural Superintendent. The first portion of the address dealing with the principles and practice of controlled grazing was published in the March issue of this Journal.

IN my previous survey of the methods by which the carrying capacity of pastures may be increased, three principal ones were stressed—

(1) The sowing down of new pasture grasses and better strains of existing grasses;
(2) scientific methods of feeding pasture to stock; and
(3) judicious top-dressing.

Emphasis was laid upon a phase of the second method, namely, controlled grazing as a means whereby, appropriately modified and applied with due regard to local conditions, the carrying capacity of much of our pasture land in the moister parts of the State could be very materially increased. But if practised of itself, unsupported by any complementary system of top-dressing with artificial fertilizers, maximum economic results are not likely to be obtained, or, if by any chance obtained, it is improbable that they can be sustained for very long without diminution of output.

It is important to recognize the drain upon the soil minerals (especially phosphorus and lime) that grazing, more particularly dairying, places upon land. Each 500 gallons of milk obtained removes from the land phosphorus equivalent in amount to the phosphoric acid in 52.6 lb. of superphosphate. From this it may be calculated that land carrying a beast to each 2 acres, with each animal yielding 500 gallons per annum, requires an annual dressing of at least 26.3 lb. of superphosphate per acre if the soil fertility in respect to phosphoric acid is to be maintained unimpaired. Although about a million acres of pasture land in this State are top-dressed with phosphates each year, the greater part of these lands is still poorer in phosphates than when first selected, because the phosphates drained away in the milk in pre-top-dressing times have not yet been restored, while on the bulk of the balance of the dairying lands not top-dressed the effects of 40 to 50 years of steady soil "mining" must be overcome before it can be considered as potentially fertile as when first farmed.

It is sometimes put forward that the drain on soil phosphates is practically negligible on farms where the skim-milk and buttermilk are fed to pigs, because these parts of the milk contain the phosphates, and butter almost none. Where store pigs are being fattened and no young pigs raised this certainly is theoretically true, but the practical effect is that the grazing paddocks are steadily lowered

in fertility because the dung and urine of these animals are rarely if ever returned to the pasture paddocks, but largely are allowed to accumulate with attendant waste on a very restricted area of the farm, so that the net effect is that fertility from the broad acres is being concentrated on a pocket-handkerchief allotment.

Upon soils already deficient in phosphoric acid, as are most in this State, this process of soil mining asserts itself slowly but very definitely in the make-up of the pastures themselves. High-grade pasture plants like clovers and rye grass—high grade because of their ability to win from the soil larger quantities than the average of food materials—suffer first. They decline in vigour and in numbers of plants per square foot, and may disappear entirely. Perhaps the explanation is that the soil is no longer able to supply them with the elementary materials they need for growth in the quantities and at the rates they require. Thus the plants are unable to grow as vigorously as formerly, and hence are overshadowed by plants better adapted to the circumstances, such as flat weed (*Plantago coronopus*) and Wallaby grass (*Danthonia Sp.*). Gradually the latter species becomes the dominant grass of the field, apparently because of its well-known low phosphate requirement. At a later stage various species of very low grade plants, such as mosses, lichens, and bracken fern may make their appearance and become aggressive.

These things happen so slowly and their steady development is so masked by seasonal irregularities that they are apt to escape all but the most observant. Even when the process is reversed by good management the improvement is not always immediately so obvious as may be expected. Forty years' abuse of Nature cannot always be rectified in a single season, nor yet two. Yet usually it is little short of miraculous what can be accomplished in the direction of uplifting the grade of the pasture species once systematic top-dressing with phosphates is initiated. Everybody is now familiar with the remarkable way in which clovers and trefoils respond to a light dressing of superphosphate on most soils. In many instances, in paddocks where the casual observer is satisfied that no trefoils were

Pasture Top-Dressing Plots at Ravenswood near Bendigo. The unmanured strip can be plainly seen.

present, the effect of a dressing of 1 cwt. of superphosphate has been to raise the proportion to as high as 50 per cent. in one season. The effect is so spectacular that he may be prepared to believe that the seed was introduced in the fertilizer, but it is just a case of stimulating with the appropriate fertilizer seedlings so unthrifty that they passed unnoticed—top-dressed, they blossom forth and dominate the pasture. These leguminous plants, weight for weight, usually are superior in protein, lime, and phosphorus content to grasses, and the carrying capacity of the pasture accordingly is increased; but on dairying lands too great a dominance, particularly of annual species which mature early, is not welcome. They are, however, signposts along the way of improved fertility. Later, when the soil is fit, it may sustain higher-grade clovers such as White Dutch, Alsike, &c., as well as better grasses.

Subterranean clover responds to a marked degree to top-dressing, so much so that on some of the richer land it is looked upon as a not unmixed blessing. The objection to it is that here it tends to dominate the pasture to the exclusion of grass species, and that it matures very early and leaves the ground bare of feed during the summer. A further objection is that it is said to be responsible for an "off" flavour in milk. Recent tests at the State Experiment Farm, Rutherglen, show that the proportion of subterranean clover in a mixture, at all events on the soils there, to a large extent can be controlled by hard grazing at flowering time. This greatly diminishes the ability of the plant to set seed and allows other plants to assert themselves. Dairy farmers who find subterranean clover troublesome in certain paddocks should try the effect of baring them down at this time with dry stock. Closer subdivision and controlled grazing also will assist greatly, for, if the subterranean clover is kept short, sufficient light is allowed to reach species of grasses which do not grow so rapidly in the earlier part of the year; hence they assert themselves and become partners of robust constitution instead of mere overshadowed weaklings.

In moist localities where other means fail and the loss of green feed, when the hot weather sets in, is a big consideration, the effect of an addition of paspalum to the pasture is worth trying. This grass formerly had a bad reputation for becoming tussocky, but it is in the irrigation areas that its aggressive habit is troublesome and on large estates where rank growth is apt to occur in good seasons. Excellent results have been obtained in Gippsland and in New Zealand with this combination. But paspalum should not be sown down by those who cannot arrange to keep it short by judicious stocking, or where it is proposed to cultivate later.

Shortly the Department will have available a number of strains of subterranean clover which mature considerably later than those at present widely grown. This means that the growing period is likely to be extended several weeks in certain localities, and hence the objection to its short growing season may disappear.

The appropriate use of nitrogenous fertilizer in conjunction with superphosphate will tend to promote the growth of grasses relative to the clovers; particularly is the effect most marked when the nitrogen is applied in the late autumn. The precise economy of the practice from this particular point of view has not yet been worked out, and therefore its use on any broad scale should be approached with caution.

So far three important points have been recognized—

(1) The heavy drain that dairying makes on the soil;

(2) the deterioration of the pasture itself by continued dairying without appropriate fertilization; and

(3) the capacity to materially and favorably alter the proportions of the various components of the pasture with appropriate applications of fertilizer and management.

Phosphatic fertilizers favour leguminous herbage; nitrogen favours grammineous herbage. In fact, each fertilizer and combination of fertilizers regularly applied is capable of materially influencing the relative proportions of the species present in the pasture. Lime and potash also tend to promote the growth of clovers and trefoils, and water soluble phosphatic fertilizers induce rather different botanical combinations to citrate soluble phosphatic manures. The altered botanical composition of pastures, due to regular applications of artificial fertilizers, is reflected in the chemical composition of the pasture itself.

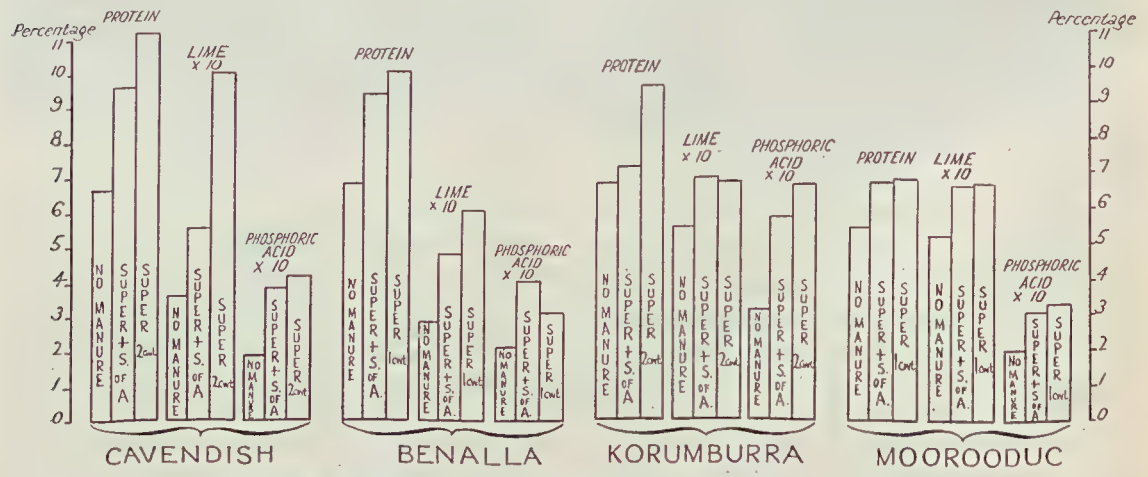
The following analyses of samples of grass at hay stage cut from various experimental plots, and showing comparisons between fertilized and non-fertilized pasture, are characteristic. They usually show marked increases in the content of protein (flesh-forming food), lime, and phosphorus (bone-forming) in herbage from the plots manured with superphosphate. It has been shown that in the main these increases are due largely to the higher proportion of leguminous herbage in the top-dressed plots, but the food content of grasses like ryegrass and cocksfoot is also actually increased. However, in the case of the native grass, Wallaby sp., there is little or no change.

The general experience is that Wallaby grass pastures do not respond, either in quantity or chemical composition, to top-dressing with phosphatic fertilizers so long as they remain Wallaby grass pastures, i.e., so long as other species do not intrude. However, most commonly in Victoria other species do intrude to a marked degree, but there are areas, notably the western volcanic plain between Werribee and Streatham, where they do not. Yet the same soil sown to subterranean clover, and top-dressed with phosphates, gives a very favorable response.

The enrichment of the actual food content of the pasture by appropriate top-dressing is a phenomenon of considerable practical importance, and at once explains why stock "do" so much better on top-dressed pasture

Table I.—Analyses of Representative Samples of Pasture (Hay Stage).

—	Protein.	Silica-free Ash.	Lime (CaO).	Phosphoric Acid (P_2O_5).
	%	%	%	%
Moorooduc Plots.				
Super., 1 cwt.	7·03	3·72	0·69	0·33
„ 1 cwt. + S.A. 48lb.	7·00	4·07	0·68	0·31
No manure	5·69	3·20	0·54	0·20
Benalla Plots.				
Super., 1 cwt.	10·20	4·38	0·60	0·31
„ 1 cwt. + S.A. 48lb.	9·59	4·67	0·48	0·40
No manure	6·98	3·03	0·29	0·22
Korumburra Plots.				
Super., 2 cwt. + S.A. + K_2SO_4	7·48	5·38	0·72	0·60
No manure	7·04	5·76	0·57	0·33
Super., 2 cwt.	9·87	7·00	0·71	0·69
Warncoort Plots.				
No manure	7·30	3·19	0·48	0·28
Super., 2 cwt. + S.A. + K_2SO_4	6·45	3·01	0·49	0·38
Super., 2 cwt.	6·71	3·26	0·49	0·30
Cavendish Plots.				
No manure	6·68	2·28	0·37	0·19
Super., 2 cwt.	11·14	4·84	1·02	0·43
„ 2 cwt. + S.A. ..	9·48	3·86	0·56	0·38
Kyneton Plots.				
Super., 2 cwt.	5·86	4·23	0·80	0·47
„ 2 cwt. + S.A. ..	5·95	3·69	0·50	0·45
No manure	5·77	3·98	0·60	0·44



Graph showing variation in Chemical Content of pastures grown under various manurial treatments.

Some of the new strains of Subterranean Clover developed by the Department at Burnley.

and why they apparently find it so much more palatable. Nowadays examples of the preference of stock for top-dressed pasture, where they have a choice, are so common that they scarcely excite any interest, but a remarkable case came under my notice some years ago on the farm of Mr. Horne, of Cudgee. Here, in top-dressing a paddock of rye grass, the broadcasting drill had been driven "wheel to wheel," thereby missing a 14-in. space regularly throughout the field. The paddock was used as a night paddock for dairy cattle, which completely neglected the pasture along the strips not top-dressed. In February, when I saw the paddock, it presented a most extraordinary appearance. Strips of dry rye grass about 15 inches tall and, say, a foot wide, alternated with close-cropped pasture about 10 feet wide, occurred with unfailing regularity throughout the field. In this instance the discrimination by the cattle was carried out to an extreme degree, and was no doubt due to an unusually marked phosphate deficiency in the grass, because the country, prior to sowing down and top-dressing, was recognized as definitely within an area known to be "cripply."

The land in the immediate vicinity and stretching easterly along the coast for a considerable distance also was so deficient in phosphates that cattle could not be reared on it in its natural condition without danger of cripples. The transformation effected in the pastures and in the health of the stock by regular additions of phosphates, both with preliminary cereal crops and directly as top-dressing, is, perhaps, the most remarkable in the State.

The abatement of diseases of cattle, the predisposing cause of which is a deficiency in phosphate of lime in the pastures, is therefore an important practical function of judicious top-dressing. Of course, it is not only those cases where there are definite pathological symptoms, primarily due to phosphate deficiency of pasture, that require correction. Quite probably phosphate deficiency in pastures in this State is commonly of such a degree that a definite limiting factor to production is constituted from this cause alone.

But, of course, there are strict practical limits in the extent to which the farmer can

exploit the possibilities of top-dressing. There are many steps which it may seem desirable he should take in the interests of his stock, of his pasture, and of the maintenance of, and even in the building up of, the fertility of his land. From time to time he has been urged with the best of good faith to apply this or that fertilizer or combination of fertilizers because it can be shown that they *must* have this or that effect, or that they are necessary for the well-being of the stock or the pasture, or the land, or all three. But, unfortunately, logical arguments do not pay the manure bills. These must be met out of the extra production caused by the fertilizer. No matter how great the increase, or how seemingly perfect the result in the pasture, unless it is a business proposition it cannot be adopted on most farms.

How is the farmer to know what fertilizers to use and whether their use is profitable? The obvious answer is that he should test them out in actual practice for himself; but, as a fact, the matter is by no means so simple as this. On the contrary, there is no more difficult type of field experimentation than the conduct of grazing trials of reasonable accuracy on top-dressed pasture. Unless the differences in yield between the various treatments being tested are much greater than are usual and elaborate precautions are taken, such trials are apt to be very misleading, because so much depends upon the judgment of the experimenter; and, where judgment is used, unconscious bias is generally lurking unsuspected in the background. Experience has shown that the conduct of such tests is best in the hands of trained experimenters. They can narrow down the many possibilities in treatment to one or two, between which there will be very little difference. Such questions as kind of fertilizer, time or times of application, quantities to apply, duration of influence, effect on the pasture, can be solved and practical illustration of the business results can be given; but, beyond that, it is a matter for the individual farmer to exploit the business possibilities in accordance with the special attributes of his own holding. There can be no common universal rate of pasture fertilization, even for the same type of land in the same district. So much depends upon what use is made of the pasture on that land. For example, if a dairy farmer conducting a milk round regards continuity of supply as of first-rate importance, it may pay him to force pastures with nitrogenous fertilizers in the winter at a cost which would be out of the question if he were supplying cream to a butter factory, and so on.

The Department began top-dressing experiments at the State Farm, Rutherglen, in 1912, and has been conducting them on an extensive scale ever since. Three main methods of measuring results are used—(*a*) Stock-grazing tests (principally sheep); (*b*) trials in which the measure of the result is the yield of grass hay obtained; and (*c*) trials in which the lawn-mower acts as the mechanical grazing animal at intervals throughout the year. All such tests have their limitations, for the perfect top-dressing test has yet to be designed, but each has proved of very definite value.

The tests conducted by the Department practically all include various kinds of phosphatic fertilizers, nitrogenous fertilizers, potash, and complete fertilizers containing all three. Lime also is applied with superphosphate. At Darnum, Werribee, Warragul, and Colac, lawn-mower trials are conducted in which the nitrogenous fertilizer, ammonium sulphate, is applied on separate contiguous plots at intervals throughout the year, and at most of the centres the length of time the various fertilizers remain effective in the soil has been studied.

The broad result of this work has been to demonstrate that phosphatic fertilizers are a fundamental necessity to increased carrying capacity on practically every dairying pasture tested. Of the phosphatic fertilizers, superphosphate has given the outstanding economic result. Basic phosphate, a mixture of lime and superphosphate, is next best, but nowhere has it given results that would suggest that it is worth the farmer's while paying a basic phosphate price for the lime it contains. One ton of basic phosphate contains about 3½ cwt. of lime. Superphosphate costs £5 a ton in Melbourne, lime 30s., and basic phosphate £6. Hence the purchase of 50 tons of basic phosphate costs £300. The equivalent quantities of superphosphate—41¼ tons and lime 8¾ tons—would cost £219 7s. 6d., a saving of £80 12s. 6d., or a substantial profit for home mixing. On the other hand, basic slag was superior to superphosphate on certain chocolate volcanic soil at Kyneton. Basic

TABLE II.—YIELDS OF PASTURE PLOTS IN CWT. PER ACRE. PLOTS EACH 1-10TH ACRE.

—	Colac. Average 1928–29.	Cavendish. Average 1929–30.	Benalla. Average 1929–30.	Korumburra. Average 1929–30.	Moorooduc Average 1929–30.	Kyneton. Average 1929–30.
No manure	10·3	1·6	8·6	18·7	6·3	11·0
Super., 1 cwt.	28·9	14·0	18·5	40·5	16·3	13·2
„ 2 „	29·8	22·3	21·0	47·3	17·2	14·2
Basic Slag, 1 cwt.	..	13·2(*a*)	13·2	..	..	..
„ 2 „	29·4	..	..	43·8	..	20·6
Super., 1 cwt.; Amm. Sulph., 44 lb.	..	..	16·9	..	17·3	..
Super., 2 cwt.; Amm. Sulph., 44 lb.	33·3	17·2	..	43·4	..	19·7
Super., 2 cwt.; Amm. Sulph., 44 lb.; Pot. Sulph., 56 lb.	38·2	18·7	18·1(*b*)	43·7	..	21·7
Super., 2 cwt.; Lime, 20 cwt.	37·1	18·3	..	50·7	15·7(*b*)	21·6
Amm. Sulph., 88 lb.	9·7	2·2	7·8(*c*)	24·4	..	15·9
Nit. of Soda, 112 lb.	8·2	2·2	..	23·3	..	..

(*a*) Basic Phosphate. (*b*) Super., 1 cwt. (*c*) Amm. Sulph., 44 lb.

phosphate was not tried there, but it is quite probable that it would also have given a good account of itself, as here superphosphate, 2 cwt., and lime, 20 cwt., gave a much better result than superphosphate alone. Lime showed little or no result unless associated with phosphatic fertilizer in all the places tested; and, so far, no area has been discovered where the results, though sometimes quite marked, are such as to warrant an official recommendation to invest money in lime for pastures at its present price, which, for first-grade finely-ground limestone, is on the average about £2 10s. a ton landed on the farm. There are some indications, however, that in the near future lime may be won a good deal more cheaply in some of the newer deposits. If such is the case and the price can be reduced to less than £1 a ton on the farm, lime would become profitable over a considerable area, and no doubt the stimulus given to investigation of its possibilities would lead to the discovery of areas where very marked response to it is demonstrable.

Potash, as potash sulphate, has not proved of value so far. Possibilities have been shown for the additions of nitrogenous fertilizer to superphosphate in certain localities, but some marked failures have resulted, and as it is a comparatively costly fertilizer, and as its effect is of relatively short duration, caution is required in its commercial use until more is known of the conditions governing its behaviour under Victorian conditions.

Table II. gives the average yields of grass hay cut from plots one-tenth of an acre in area in each of six districts for the years 1929 and 1930. Single mower strips are cut down each plot and the produce cocked, dried, and weighed. The results have most value as indicating the yields of hay obtained, but inspection at other times of the year showed that on most of the sites in question the hay weights approximately indicate the relative order of the result at most other times of the year. However, at Colac and Kyneton, a winter response to nitrogen was apparent, although this had practically disappeared at hay-cutting time.

Upon the question of the time one application of superphosphate remains effective a good deal of data has been collected. Tests at Hamilton on chocolate soil with virgin pasture showed that a single application of superphosphate at the rate of 2 cwt. per acre showed marked residual effect up to five years, after which time it disappeared. This is well illustrated by the following table:—

TABLE III.—PASTURE TOP-DRESSING PLOTS, HAMILTON.

Immediate and Residual Effect.

Yields in cwts. per acre.

—	Immediate Effect.	Residual Effect. (No fertilizer applied.)				
	1920.	1921.	1922.	1923.	1924.	1925.
No manure	8·0	15·3	15·9	21·4	20·5	13·5
Super., 2 cwt., 1920	30·4	24·5	22·6	29·5	31·1	12·1
Basic Phos., 2 cwt., 1920	29·1	21·3	23·5	27·9	21·3	12·1
Super., 2, and Lime, 10 cwt., 1920	35·4	29·3	25·7	31·9	35·1	17·5

Other examples are Warncoort, light sandy loam, native pasture with volunteer subterranean clover, and Benalla, chocolate and grey loams, native pasture.

TABLE IV.—PASTURE TOP-DRESSING TESTS, WARNCOORT AND BENALLA.

Yields of Bulk Plots.

Immediate and residual effect of Superphosphate.

	Immediate Effect.	Residual Effect. (No fertilizer applied.)			
	1926.	1927.	1928.	1929.	1930.
	cwt. p. ac.	cwt. p. ac.	cwt. p. ac.	cwt. p. ac.	
A. WARNCOORT.					
No manure ..	3·8	Plots	12·5	4·0	Plots
Super., 1 cwt., 1925–26	16·1	grazed	21·5	11·3	discon-
„ 2 „ „	23·6	to sheep	29·4	23·4	tinued
B. BENALLA.				Plots top-dressed	
No manure ..	19·9	7·1	16·1	again	
Super., 1 cwt., 1926..	35·6	10·1	21·8	in 1929	
„ 2 „ „ ..	43·0	16·4	24·0		

At Benalla in 1926 406 bales of hay weighing 7 tons 7·8 cwt. were cut from 4½ acres. The plots in both cases are each 1 acre in area.

On the very light, phosphate-deficient soils in the west of Victoria, where the combination of superphosphate and subterranean clover has transformed the country, there is a marked falling away in yield if the superphosphate dressing is omitted. The reason for this is not precisely known, but possibly it is not unassociated with the tremendous response obtained immediately following the application. These soils apparently have the capacity of parting with the bulk of their added phosphates very rapidly, and hence retain but a modest amount for future use.

The demonstration of the marked residual effect of superphosphate is of considerable economic importance, because it extends the commercial use of superphosphate to pastures of much lower carrying capacity than would otherwise be commercially feasible. Even at normal prices for wool and lambs it is very doubtful whether it would pay to top-dress normally constituted land having a carrying capacity below one sheep per acre, even where the carrying capacity was doubled —that is, if proper charges were allowed for all costs, including depreciation. When, however, the effect is so spread that a fresh application is not required for three or four years on the same land, it was a payable proposition. With the fall in the price of wool and lambs, however, it is difficult to see how it will pay to top-dress this light land, except in those cases where the response to the fertilizer is very much above the average. Again the circumstances may be completely altered where "wether" country has been so improved by top-dressing that it will carry and fatten ewes and lambs, or where the losses by death are greatly reduced and general improvement in thriftiness is most marked.

There are, as yet, no accurate data as to how often the dressing should be repeated on good dairying land. But the dairy farmer has a pretty accurate check on that—his cream cheques. In certain irrigation areas on some pastures from 2 up to 4 cwt. per acre of superphosphate has been shown to be profitable. In Gippsland, on good flats, 2 cwt. per acre is now a common dressing. Elsewhere, on dairy farms, it is safer to use 1 cwt. per acre. On sheep country of average fertility, unless of very high carrying capacity, intermittent dressings—never more than 1 cwt.—are worth attention, with intervals of one to five years allowed between dressings, as experience dictates. On light subterranean clover country annual dressings of 1 cwt. per acre may be advisable.

From time to time various statements are made that superphosphate sours the land, that it ultimately impoverishes it, that it is a soil tonic only, that it washes out of the soil and is largely wasted, that it alters the pasture adversely, that the butter of cows fed on top-dressed pastures is tainted, and that fat sheep fed on top-dressed pastures die because of the superphosphate, and so on, until one wonders why it is, and the thought occurs that similar criticism must have been made of the goose that laid the golden egg. The result seems too good to be true; we cannot but suspect that there is some confidence trick in it that later we will have to pay for, and pay dearly.

These assertions can be answered seriatim—

(1) Superphosphate does not sour the land. It does not influence the soil acidity in any way, and that has been proved conclusively after 80 years' application at Rothamsted, in England, and 18 years at Werribee and Rutherglen State Farms.

(2) It has not impoverished the soil at any of these institutions as measured by the yields of the crops, comparing no manure with treated land.

(3) It cannot be regarded as a tonic in the sense that it stimulates the land to action as a drug does human beings to false activity. It is a plant food—the most deficient plant food in our soils. Unless it is present in the proper proportion, the rest of the plant foods cannot be used to the full degree.

(4) It does not wash out of the soil, and none is wasted.

(5) It certainly alters the pasture—in most cases in directions which all agree are a great improvement; but, in the case of certain native pastures, annual plants may be stimulated to such an extent that the native plants are gradually crowded out, but the carrying capacity is increased. Where this is the case, ought we not to reverse our opinion as to the value of the so-called inferior herbage which, top-dressed, has a higher carrying capacity than the native grasses replaced?

(6) The cream may be flavoured by rank clover growth, particularly subterranean clover, but the flavour may be removed by proper treatment.

(7) That fat sheep die.—Expert veterinary opinion states that usually deaths are due to bloat. On rich pastures sheep must be managed more like dairy cows. Rotate the sheep, keep the pastures short by stocking heavier, and keep the sheep travelling for feed.

[*This address will be concluded in the May issue, in which the results of tests with nitrogenous fertilizers will be outlined.*]

Stallion Register 1930-31

(Under the Horse Breeding Act 1928)

Stallions in respect of which Certificates of Registration have been refused but which, the owners having paid the prescribed fees, may be retained and used for breeding purposes with owners' own mares only. Registrations prior to 31st March, 1931.

Name.	Age.	Class.	Owner.	Address.
Barfold	A	Draught	N. J. Hanrahan	Barfold
Baron Black	3	,,	H. E. Gregory	Hopetoun
Baron King	3	,,	W. A. Evans	Bangerang
Baronet	A	,,	W. Cameron	Lascelles
Basil More	6	,,	W. Bilstein	Pirlta
Bonny Obedience	5	,,	C. Storer	Branxholme
Briton Bold	6	,,	G. Crittenden	Lake Hindmarsh
Buchylyvie Again	A	,,	J. H. and W. Oldfield	Nhill
Champion	A	,,	Mrs. B. Willmott	Trentham
Clyde	A	,,	C. Hebard	Coleraine
Coil	A	Light	W. Craven	Heathcote
Donald	6	Draught	Smart Bros.	Gooramadda
Fish Creek Baron	A	,,	J. J. Mackin	Fish Creek
Flash Direct	A	Light	C. T. Evans	Rathscar
Flash Light	3	Draught	L. J. Mason	Warracknabeal
Flash Mac	4	,,	L. M. Simon	Pinnaroo
Hill King	A	Light	A. E. Cumming	Berrimal
Kelvin Wilkes	6	,,	J. Kane	Bayles
Lord Nolan	A	Pony	W. Hubble	Maryborough
Mac Success	4	Draught	F. W. Elsom	Wallup
Major Bells	6	Light	E. Rash	Ballarat
Menestral Lad	A	Draught	C. Taylor	Annuello
Munro Boy	3	,,	F. H. Coombs	Mangalore
Nailstone Barossa	4	,,	O. McCabe	Underbool
November	6	Light	Ramage and Mason	Violet Town
Nuggett II.	A	Draught	G. Lord	Eskdale
Ondit	A	,,	Executors N. Thornley	Hawkesdale
Paul	6	,,	D. A. Zippel	Wonwondah East
Pedro Pronto	A	Light	G. Stow	Prahran
Pride	3	Draught	D. Ball	Lismore
Prince Edward	A	,,	T. Hennessy	Gowangardie
Punch	A	,,	Mrs. J. McLean	Garfield
Regent	3	,,	C. Nelson	Benalla
Repeater's Pride	A	,,	G. Pitt	Jeparit
Royal Newton	4	,,	J. Warwick	Strathallan
Royalston	5	,,	W. G. Ballantine	Cosgrove
Scotty	A	Pony	E. J. Simmonds	Bendigo
Sultan	A	Light	E. T. Wilkinson	Raglan
Warwick	A	,,	W. H. Rogers	Nar-nar-goon
Young Harold	A	Pony	W. Newton	Cape Bridgewater

Seeding the Wheat Crop

By W. B. Miller, M.Agr.Sc., Inspector of Agriculture

IN this article on the preparations for seeding the wheat crop, it is not the intention to lay stress on the value of the wheat crop to Victoria, nor to discuss the means by which many hard-pressed wheat-growers will be financed. Such contentious matters are occupying the attention of every one connected with this great industry, all of whom are anxious that the 1931 crop will be sown over a large acreage and under the best conditions possible.

Apart from the economic questions, the wheat-growers have other problems to face. The recent lean years have shaken, to some extent, their confidence in the capacity of their land to produce heavy crops, but with a return to average seasons, good yields undoubtedly will be obtained all over the wheat belt, just as they were last year in those districts where the rainfall was generous.

Heaviest yields may always be expected on fallow land. That there are exceptions to this rule in no way disproves it! Because of the record acreage sown in 1930, many growers have not prepared their usual area of fallow, with the result that thousands of acres of stubble land, and of land which failed last year, will again be planted with wheat in the coming season. As in every type of business, plans have been upset, and the usual rotational systems of wheat-growing have been departed from. Risks will be taken in the hope that good yields over a large area will offset the low price of wheat. To do this, many difficulties will have to be overcome, but it will be the aim of all to do everything in their power to *sow each acre well.* Scratched-in crops are seldom payable, no matter what the price of wheat may be. Below are outlined some of the more important factors to be considered before the seeding period is entered upon.

Although the heavy tropical rains in December seriously interfered with harvest operations, they were not altogether useless. The fallow and other land in many places received its first real soaking for many years. Summer weeds grew strongly, but when they were destroyed by cultivation or sheep, and all signs of the rain had gone, the subsoil beneath remained in a saturated condition. This reserve of soil moisture should be of great assistance to the crops in the coming season.

The treatment of the fallow demands first consideration. Every endeavour should be made to keep the weeds in check. If the sheep cannot cope with them, the cultivators

or knife bars will be necessary. In the great majority of cases, the fallow will have been cultivated after the early autumn rains and, unless another germination of weeds occurs, will need no more attention until after further rains or just prior to seeding.

In the meantime, the teams or tractors may be kept busy preparing stubble land. All stubble or lay land to be sown with either wheat or oats this season should have been broken up early. In many cases such land is merely combined straight in but it is always an advantage to give it a preliminary cultivation. A short fallow, even if only for a few months, is of immense value. The sundercut or other one-way disc implement is useful for this purpose. Where there was much green undergrowth in the stubble, it may have been impossible to obtain a burn, but where there was sufficient dry stubble straw, even if only in patches, burning should have been attempted. Not only are weed seeds killed and subsequent cultivations made easier, but a severe check is given to such wheat diseases, as take-all and flag-smut, to which stubble-sown crops are particularly subject. Combines or drills fitted with discs instead of hoes are a great advantage when sowing land where the straw or dry weeds are likely to cause serious blockages. It may be profitable to replace the hoes with discs in order that the sowing may be completed in one operation.

In all cases, the object of autumn cultivation, apart from the conservation of moisture, is the preparation of a clean, firmly-packed, and fine seed-bed, covered by a loose mulch 1½ to 2 inches deep in the loose Mallee and black Wimmera soils, and from 2 to 2½ or even 3 inches in clay soils. Care has to be taken that the mulch on the clay soils does not become too fine, and for this reason excessive harrowing must be avoided.

To obtain a clean crop and maximum yields, it is best to defer seeding operations until after a good sprout of rubbish has been obtained. The season this year has been particularly favorable for this, and ample opportunity to destroy the weeds has been given. Sowing in the Mallee and Goulburn Valley should always be completed by the first week in June. Late sowing is one of the most frequent causes of crop failure in these districts.

Varieties Recommended.

Next to soil preparation, the choice and treatment of the seed-wheat is most important. Seed of proved high-yielding capacity should be sown. The majority of growers already have secured their seed, but others may still desire to obtain new varieties, or to change their seed. The results of departmental tests and farmers' experiences show that great dependence can be placed on the following varieties in the districts named:—

Wimmera. — Free Gallipoli, Federation, Wannon, and Nizam.

Goulburn Valley.—Free Gallipoli, Major, Nizam, and Ghurka.

Mallee.—Sepoy, Ghurka, Free Gallipoli, Ranee, Currawa, Yandilla King, and, for late sowing on small areas only, Rajah, Waratah, Nabawa, and Macs White.

On new Mallee country, where shoots are likely to interfere with harvesting operations, or in country where thistles may give trouble, the taller strawed varieties are preferred to such wheats as Sepoy and Ghurka.

North-East. — Free Gallipoli, Federation, Major, Ghurka, and Turvey.

Western and Central Districts.—Major, Ghurka, Mogul, Free Gallipoli, Federation, Ranee, and Nizam.

Seed-wheat should be thoroughly cleaned in order that weed seeds, and other foreign matter will be removed. If any straws or headings are left in, blockages in the seed runs of the combine or drill will result in costly misses in the crop, as well as loss of valuable time.

All seed should be pickled against ball smut, even if it has been bleached or if it is intended to sow dry. The risk of a smutted crop is great unless the pickling is carefully done. It is advisable that this work should be carried out by the dry method at an early date. Departmental tests have proved that formalin and the dry copper bunticides are to be preferred to bluestone. Formalin is very satisfactory, except when it is intended to sow the wheat dry. It retards germination much less than does bluestone, provided that the pickling is done the day before sowing. The correct strength for formalin pickle is 1 lb. of formalin to each 45 gallons of water used, and the time of immersion is three minutes. All floating smut balls should be skimmed off.

The dry method of pickling does not interfere with germination at all, and should be used in all cases of dry sowing. An additional advantage is that the seed may be pickled months before sowing, an important factor for a man working single-handed. In cases where settlers cannot avoid sowing seed obviously smutted, formalin should be used in preference to the dry method, and on no account should the skimming off of the smut balls be neglected.

The rate of sowing depends largely on the district, but also on the class of ground. On fallow in the Wimmera, Goulburn Valley, North-East, and in the Central and Western Districts, 70 to 75 lb. of seed per acre is desirable. In the older Mallee districts, 60 to 65 lb., and in the new Mallee 50 to 55 lb. of seed should be sufficient. The maximum rate of seeding should be used on well-worked fallow, and when sowing late.

The rate of sowing this year is of particular interest in those districts where the grain has been damaged by rain or shrivelled because of the poor season. It is not generally recognized that germination tests may easily be conducted on the farm. They are best done in the garden near a water supply. If a 95 per cent. germination is obtained, the sample may be regarded as good, even if its appearance is poor. If there are any doubts, conduct your own tests, and try some obviously good wheat alongside to act as a check.

Many growers will be sowing some small or shrivelled seed this year. Probably plans have been made to keep, say, 300 bushels of seed-wheat. In many cases only the bare seed requirements have been retained on the farm. It should be remembered that small seed often runs through the drill faster than normal seed. Care, therefore, should be taken to weigh out the seed, and calculate the amount sown on, say, the first 10 acres. Otherwise there may be a shortage of seed towards the finish.

There are some who consider that it is right to sow less graded seed per acre than ungraded seed. There are more grains per bushel in an ungraded sample than in the same sample after grading. If for any reason the size of the grain to be sown is less than average, there is no need to sow a greater weight per acre. In fact, the rate of sowing should be slightly reduced in such circumstances.

With regard to manures, it is well known that the most profitable yields cannot be obtained unless superphosphate is liberally applied. To many growers, the problem of obtaining supplies of superphosphate is an acute one. It is largely a matter of finance. Assuming that this is satisfactorily arranged, the question of the amount to use per acre has to be decided upon. This matter was fully discussed in an article by the Agricultural Superintendent, Mr. H. A. Mullett, B.Agr.Sc., in the February number of this *Journal*.

Every effort should now be made to finalize preparations for sowing. Although it may not be possible to decide upon the exact acreage to be sown, the greater part of the necessary seed and manure can be made ready, and most of the superphosphate carted to a convenient place under shelter. Few wheat-growers can look back on a seeding period which was not protracted in some way by delays which could have been avoided. Accidents may happen, despite all precautions taken, but, by efficient preparations, and a knowledge of what to do in emergencies, the experienced farmer will reduce delays to a minimum.

There are a number of other preparations which, if done now, may save many valuable hours when the crop is being rushed in. They may seem obvious to many, but often they are neglected, and I am setting them out below to serve as reminders.

1. Make provision to keep the manure dry when it arrives.

2. Attend to the horses. Get the clipping done now, particularly the shoulders and withers. Examine the teeth and feet, overhaul the harness, refit the collars, and restock the medicine chest.

3. Get plenty of chaff cut when time allows.

4. Attend to the tractor and implements. Few new machines will be bought for some time. When overhauling the combine or drill, remember to see that the driving mechanism from the wheels to the stars and cups is in order. Replace broken spokes, pinions, or cogs, and find the change cogs and tools. They are usually missing. Provide new points, and give the machine a short trial as early as possible.

5. The supply of lubricating oils and grease should be replenished.

The Oriental Peach Moth

A Serious Pest in the Goulburn Valley

R. T. M. Pescott, M.Agr.Sc., Entomologist.

Fig. 1.—Peach twig showing typical twig injury.

FOR many years, peach-growers in Victoria have suffered severe losses to their late peaches by the ravages of a caterpillar which up to the present time has been popularly spoken of as the Codling moth. The Goulburn Valley apparently has suffered the most, losses estimated at 15 per cent. of the late maturing crops occurring. Evidence pointed very strongly to this insect being the Codling moth. Firstly, the damage occurred to any extent only after the early pears (Williams) were picked, and it was assumed that the next brood of moths flew to the peaches. Secondly, the damage apparently was most severe on peaches adjacent to pear blocks. Moreover, the caterpillars doing the damage were very similar externally to those of the Codling moth.

An examination of a large number of peaches affected showed, however, some variations in the method of attack from that of the Codling moth, while a number of the insects in question frequently were found in the pupal stage at the stem-end of the peach. This never occurs with the Codling moth. In view of the above, life history studies were carried out, and the insect was definitely determined to be the Oriental peach moth (*Laspeyresia molesta,* Busck.).

Distribution.

It is fairly certain that the native home of the Oriental peach moth is Japan. From there it has spread to the United States of America, where it is found practically only in the eastern States. It has also been recorded from France, Italy, and parts of Australia. Froggatt[1], in 1914, records this moth as the Peach Tip Moth attacking peaches in the metropolitan districts of Sydney. Further reference has been made to this pest in New South Wales in later years.

It was originally thought that the only plants attacked were peaches and the various cultivated species of prunus, viz., cherry, plum, apricot, and flowering cherries, but quite recently it has been found that the quince and apple are as readily attacked as the peach. So far the extent of the infestation in apples and quinces in Victoria is not known.

Character of Injury.

The character of the injury and the amount of damage done vary at different periods of the year, and on different food plants. The actual injury caused is of two distinct kinds, namely, injury to the twigs and injury to the fruit. The former is particularly severe on young trees, and occurs mostly before midsummer while the twigs are soft; the latter form usually does not become severe until after midsummer.

The injury to the twigs is first noticed in the spring when the shoots are about 6 inches long. The first symptom apparent is a slight wilting of a single leaf at the tip of a twig, or, in some cases, the whole tip of the twig wilts and a small amount of frass or debris is evident. The frass marks the point

of entrance of the larva, and the wilting of the twig is occasioned by the boring of the larva within. As the tunnelling proceeds the tip of the twig continues to wilt and finally dies (Fig. 1). Usually before the twig has completely dried, the insect leaves it to find another feeding place, or to spin a cocoon, if it has completely developed. A larva seldom reaches full development in a single twig, usually four or five tips being killed before the larva is matured.

The amount of twig injury varies considerably on different food plants, the peach coming first in severity of attack. Young cherries are the next most severely attacked, with quince, plum, apple, nectarine, and apricot following.

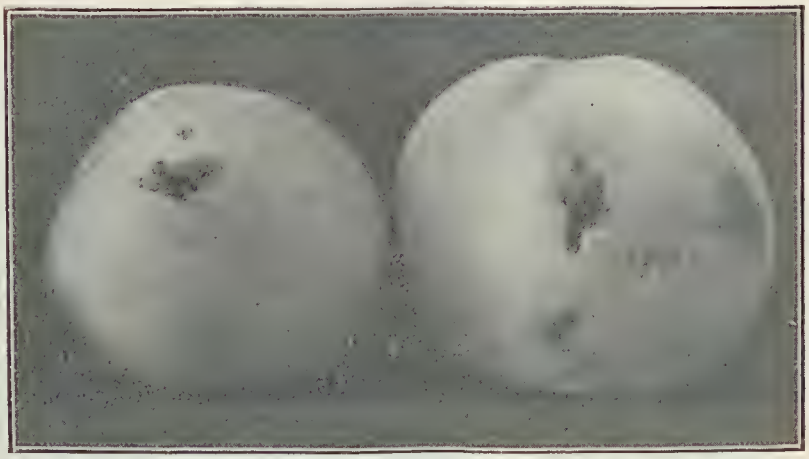


Fig. 2.—Typical side injury caused by the early broods of Peach Moth.

Fruit Injury.

Injury is first noticed in peaches about the time the fruit is half grown. The earliest injury is caused by the larvae of the second generation, the first brood larvae confining their attention solely to the young tips. The second brood larvae usually bore into the side of the peach (Fig. 2) tunnelling through the fruit until they are fully developed, and emerging sometimes at the point of entrance, but usually through another hole. Such injury generally does not cause the peach to rot or fall to the ground when the fruit is green, but the sap exudes from the wound, forming a smear of gum on the outside.

Fis. 3.—Injury to the interior of fruit.

Most of the third brood larvae commence working in the twigs in a similar manner to the first brood larvae, but as soon as the mid-season and late peaches commence to soften and ripen, they leave the twigs and enter the fruit, where they cause the most severe injury. The spot on the fruit most often selected as a point of entry is the area surrounding the stem. When the fruit is beginning to soften the larvae work beneath the skin at this point, and go directly to the seed, leaving in many cases no sign that they have entered (Fig. 3). The small larvae may not be discovered, even after opening the fruit, for at first they work along the grooves on the seeds. Another favourite point of entrance is between two peaches which hang against each other, or on that surface of a peach on which a leaf is resting.

Injury to apples occurs only in late season apples, the earlier maturing varieties being fairly free.

Life History of the Oriental Peach Moth.

The egg is scale-like in form, round or oval, flattened towards the edges and slightly raised in the centre. The general colour is greyish-white. In peach orchards the eggs are found usually on the under-surface of two-thirds to full-grown leaves near the terminal ends of growing twigs. In quince or apple

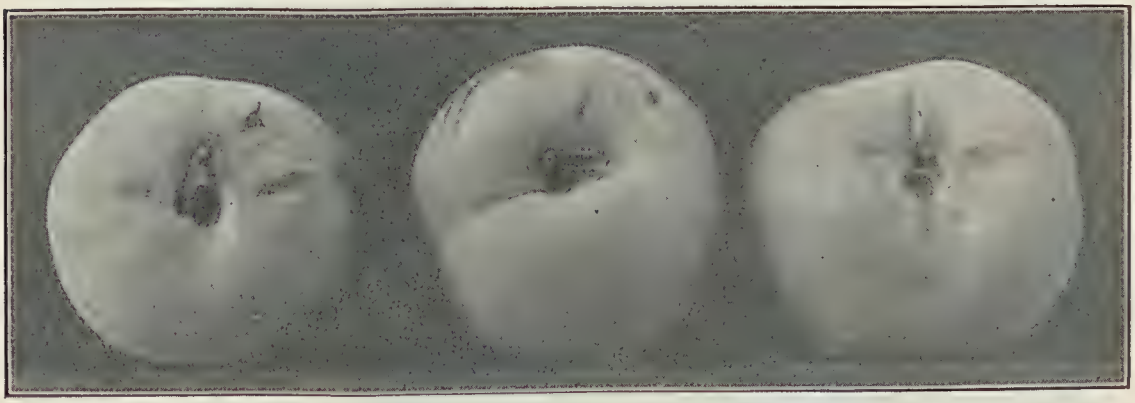
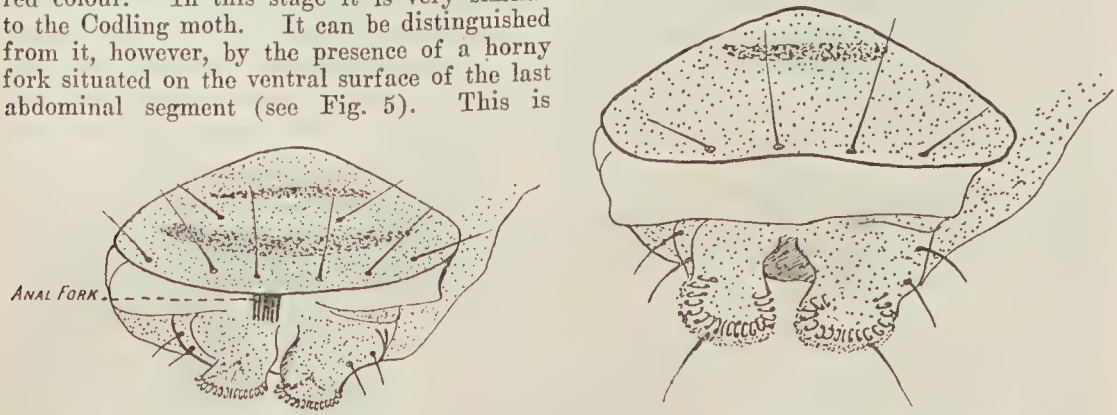


Fig. 4.—Showing position of Summer Cocoons at stem edge of Peach.

orchards the eggs are placed on the smooth upper surface of the leaf. Eggs are deposited also on newly formed smooth twigs, such as peach and pear twigs. The texture of the surface seems to be very important—smooth surfaces being preferred to rough or hairy ones. In summer the egg hatches in from three to six days, and the larva immediately searches for food. The larvae do not feed as they enter, but withdraw their heads from the burrow, casting aside the fragments of tissue until they reach more succulent parts. It is for this reason that the use of arsenate of lead sprays fails to prove effective in the control of the pest.

The larva, in general characters, is very similar to that of the Codling moth. In its early stage it is white in colour, but when about to pupate turns to a pink or almost red colour. In this stage it is very similar to the Codling moth. It can be distinguished from it, however, by the presence of a horny fork situated on the ventral surface of the last abdominal segment (see Fig. 5). This is not present in the Codling moth. The feeding period of the larvae lasts for about from eight to sixteen days. A strong silken cocoon is spun by the larvae when about to pupate. The summer broods usually pupate around the stem end on the fruit (see Fig. 4), but later broods drop to the ground from the fruit and spin underneath the bark at the base of the tree. After remaining about eight days in the pupal stage they emerge as the perfect moth. This is greyish-brown in colour, and of a similar size to the Codling moth. The forewings, however, are slightly marked with white scales, whilst those of the Codling moth are characterized by bronze markings. The moths have a wing expanse of about half an inch.

The insect hibernates in the larval stage in cocoons spun in autumn after the larvae are



A.—The Oriental Peach Moth. **B.—The Codling Moth.**

Fig. 5.—Ventral view of the anal appendage of the Oriental Peach Moth and the Codling Moth showing the fork present in the Oriental Peach Moth.

fully developed. In the orchard the majority of them spin their cocoons in small cracks in the bark, under rough flakes and in curled ends of bark strips on the trunks.

Control Measures.

The Oriental peach moth, possessing as it does the peculiar feeding habits in the larval stage previously mentioned, has proved most unamenable to artificial control by the use of arsenical sprays. This has been shown particularly in the work of Stearns[2], and Wood and Selkregg[3].

The use of 40 per cent. nicotine sulphate at a strength of 1 in 400 has been shown to reduce the amount of infection on the young growing tips of the peach tree without absolutely controlling the pest. Attempts made to control the insect by destroying the chrysalid stage by the use of miscible oils and nicotine also have proved ineffective.

The most recent stage of control work overseas is based along the lines of breeding of parasites of the family *Ichneumonidae*, certain of which are parasitic on the larval stage of the insect. This work, is is hoped, will provide some practical means whereby this insect can be controlled.

REFERENCES.

1. Froggatt, W. W. The Peach Tip Moth.—*N.S.W. Gazette*, xxv., p. 413.
2. Stearns, L. A. Some Larval Parasites of the Oriental Peach Moth.—*New Jersey Bulletin*, 460.
3. Wood, W. B., and Selkregg, E. R. Further notes on Laspeyresia molesta.—*Journ. Agr. Research*, xiii., p. 59.

Frost Protection of Citrus Trees.

Recent experiments carried out by Mr. E. S. West, Officer-in-Charge, Commonwealth Research Station, Griffith, are summarized in the February, 1930, issue of the *Journal of the Council for Scientific and Industrial Research.*

Briefly, the conclusions reached are as follow:—

(*a*) Orchard Heating, although the best method, is often too expensive.

(*b*) Smudge Fires (except for what little heat they generate) are of very little value.

Various mechanical means of protection were tried, and it appeared that—

(1) Wrapping a few thicknesses of paper round the stems of young trees gave the best protection (3 trees killed out of 16).

(2) Mounding up soil round the stems was effective protection to the stem, but increased injury to the branches (3 trees killed, and 10 badly affected out of 17).

(3) Protecting the stems with a cylindrical wire-netting frame 3 inches in diameter covered with hessian was less effective still (6 trees killed out of 17).

(4) Covering the foliage with straw was of little use (8 trees dead, 3 badly affected out of 16).

(5) Placing a hessian bag, either tarred or not tarred, completely over the tree, and covering the bottom with soil was distinctly detrimental (all trees were killed).

(6) Of the unprotected trees 11 were killed, and one badly affected out of 17.

The results are not considered to be conclusive, and it is hoped to repeat the experiments when opportunity offers.

The Orchard Green Crop

By FRANK M. READ, M.Agr.Sc., Horticultural Research Officer.

BY the term "Green Crop" is usually meant a crop sown between the orchard trees in autumn and ploughed under in spring. It is in this sense that the term is used in this article. The green crop, I believe, is the Cinderella of orchard practices. There can be little doubt that her big sisters—pruning, artificial manuring, spraying, and cultivation—get most of the attention, while many orchardists fail to realize that the green crop is in the same family.

A crop of Tick beans and Dun peas sown at the rate of one bushel of each with 2 cwt. of superphosphate, at the experimental grove, Tresco.

Far be it from me to suggest that the former deserve any less attention than they receive; on the other hand, in most cases, they merit more. Nevertheless, the practice of sowing and ploughing under a green crop is in still more urgent need of recognition. And yet we are dealing with no new discovery; the ancient Romans knew its advantages and knew even that leguminous crops such as peas and vetches, &c., had particular advantages which modern investigation has traced to the bacteria living in the root nodules of such plants.

Let us briefly summarize our present ideas on this important question.

In the first place, the addition of large amounts of humus to a soil markedly affects its *physical* properties. Such organic material, together with the clay fraction of a soil, constitutes what is known as its colloidal fraction. It is this jelly-like part of the soil which chiefly decides its physical properties. It might be said that the colloids are as important to a soil as cement is to concrete. In both cases relatively small amounts of very finely divided materials are able to change very materially the properties of the mass.

The amount of water the soil can absorb, the degree to which it swells when wet, and cracks when dry, are all largely decided by the amount of colloidal material it contains; and without going into great details it can be said that, up to a fairly high limit, in most Victorian orchards, the more humus the soil contains the more easily worked it will be, and the better will be the water relationships for the plant.

There is, however, another very important physical effect produced by the green crop during its growth—the removal of soil water in the transpiration loss from the leaves. This was first brought home to me in the soil drainage experiment being conducted at Tresco. It was found in those experiments that a crop of peas and beans removed, during its growth, up to 40 times as much water from the soil as was removed by a very complete system of tile drains.

In many of the higher rainfall districts of Victoria, orchard subsoils become waterlogged during the winter months, and in such cases the green crop as a draining proposition will be

found to more than justify itself. Experience last year already has confirmed this; many growers have told me that since their attention has been directed to this phase of the subject they have made observations which thoroughly support the original ones at Tresco. It should not be overlooked, however, that in a dry spring the crop may compete very seriously with the trees for moisture unless it is turned under before the trees start into growth.

A Summer Crop used as an aid to drainage.
To prevent a high water table on the experimental grove at Tresco, 12 ft. strips of Sudan grass are grown between the rows, from November to March.

From the chemical point of view, soil humus is very important for many reasons. In its decomposition weak acids are produced which render much more soluble, and therefore available, the plant food of the soil. Again, particularly in the case of legumes, nitrogen is added to the soil as a final stage in its decomposition. It should be remembered, however, that this nitrogen is not available for a considerable period after the crop is ploughed under. It is customary to hear growers declare that they do not apply nitrogenous fertilizers because they consider their green crops supply sufficient of this element.

Nitrogen, it is thought, is particularly necessary to aid fruit setting, and should be present in available form during blossoming. Under many conditions its abundance later in the season is undesirable, and it would appear that the green crop, as it is usually handled, does not supply the tree with nitrogen at the correct time of the year.

When a green crop is ploughed under there is a very marked disappearance of soil nitrates for some time. This statement may appear strange, but it is none the less a fact that the green crop when turned under may, and generally does, cause a definite nitrogen starvation for some weeks. As mentioned above, soil nitrogen is very important at blossoming, and from this point of view it is essential that the crop should be ploughed under five or six weeks before that time. Many cases of faulty setting of fruit probably could be traced to that cause.

We have still a great deal to learn on this aspect, for it appears that the effects of different crops may be widely different. Malherbe, for instance, in South Africa finds that the nitrogen starvation following peas is of only three weeks' duration, whereas when cape weed is ploughed under the soil nitrate is depressed for more than twice that period. This would mean that cape weed should be ploughed under, say, seven weeks before blossoming, whereas with peas three weeks before would be long enough.

From the bacteriological point of view humus is important because it provides the food material for those countless billions of tiny creatures which inhabit the soil, and as a result of whose activities the unavailable soil particles are converted into forms which the plant can absorb. By increasing the soil humus, this soil population can be increased enormously with very beneficial results.

We come now to the question, "How can we best supply humus to our orchard soils?" I do not pretend to be in a position to speak definitely; it is a subject to which we are at present giving a good deal of thought; but I would like to state the position as I see it.

There would appear to be three main methods of providing soil humus in addition to the application of farm yard manure and straw, and so on:—

1. We can sow a crop of peas, beans, oats, barley, rape, or, in fact, any crop which will grow well and give us a good bulk within a few months. In general, I think the leguminous crops are preferable when they will grow strongly; but if they will not thrive the crop most suitable to the district should be sown. If this crop is not already known, then

Natural herbage on a Beaconsfield orchard, August, 1930.
This area was unmanured for two years previously. The herbage is very scanty and yellow in colour.

experiment should determine it. It is essential that such a crop be sown early so that it secures a good start before the cold weather comes. March is the best month from this point of view. I know many orchardists will say that they rarely have time to put in a green crop, and that, any way, harvesting operations extend into March, and later still, so that if a crop were sown it would be trampled on and spoiled. It is undeniable that some orchardists do, nevertheless, manage to sow the crop satisfactorily generally by doing alternate rows in alternate years so that there is still room to reach every tree without walking or driving over the sown area.

2. We can establish such a plant as subterranean clover, which will reseed itself naturally. This has been done on several orchards in the Gippsland and Peninsular districts with apparently satisfactory results. There does not appear to be much difficulty in reseeding subterranean when it is ploughed under, as is the general rule at present, in September or later, for the plants go on maturing after ploughing, and until the surface is broken down by the cultivators and harrows. But September ploughing is, as we have suggested, possibly too late, and if this is so it would seem desirable to try some of the earlier maturing strains of clover which are being successfully developed at Burnley, so that the seed will be formed some weeks sooner than at present, and enable us to get on with the plough in August.

3. The third alternative which may be useful as a stop-gap, but which would not appear to be as permanently satisfactory as the former two, is to allow the miscellaneous herbage to grow by ceasing cultivation in March. This can probably be encouraged by top-dressing with artificial fertilizers. I would suggest that growers try the effect of broadcasting in autumn with superphosphate and sulphate of ammonia or some other nitrogenous fertilizer at the rate of 1 to 2 cwt. per acre, both together and singly. At Beaconsfield last year the increased growth of cape weed as a result of applying nitrogen was phenomenal, and it is certain that on many soils in this district nitrogen starvation is a very real thing. On such soils sulphate of ammonia will be found preferable to superphosphate as a top-dressing.

All these three possibilities are being studied; and, if growers will give this very important matter the careful consideration which it demands, we shall be able to secure some very useful information within the next few years.

Natural herbage in adjacent rows which had received nitrate of soda in the previous spring—nearly a year before the photo. was taken.
Note the Cape weed right up to the crotch of the tree. It was of a good dark-green colour.

Dairy Buildings

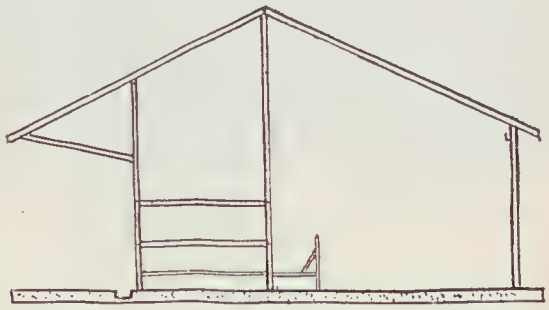
Plans and Specifications

By J. M. Kerr, Chief Dairy Supervisor.

IN the construction of such farm buildings as the milking shed, the separator room, and the cream storage room or dairy, the first consideration—even transcending the important one of labour saving—must be sanitation and working hygiene. Of course, it is most fitting that these two essentials each receive its due meed of consideration, for both are of extreme importance. It does not do, however, to assume that money unspent is necessarily money saved. There is no escaping the obligation of dairy sanitation. Even if we could shirk the moral obligation to observe cleanliness and sanitation for health's sake, and the legal obligation in the same connexion imposed by the Milk and Dairy Supervision Act, we cannot possibly evade the commercial obligation to produce a tasty, sound, and good-keeping butter. So imperative is a high standard of dairy sanitation (which in one word means cleanliness) that any labour-saving at its expense is likely to be anything but an economy, however it may figure as a convenience.

Where only decent standards of bacteriological pureness can be tolerated (as in modern dairying), the best labour-saver in the long run is sanitation of design.

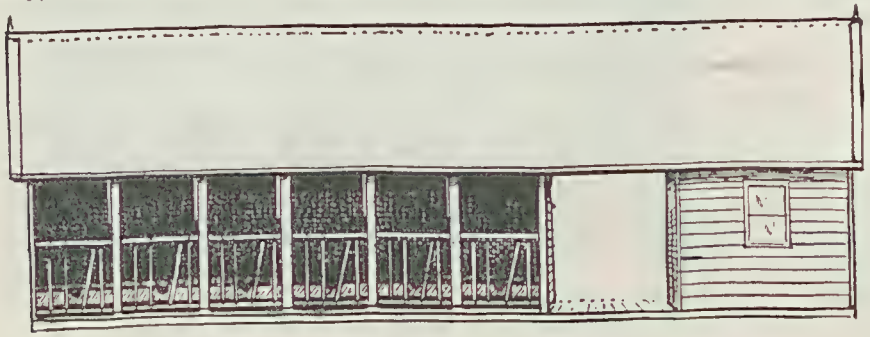
Hence, in designing a milking-shed or a dairy, however one may appreciate the value of labour saving, one finds the interests of sanitation constantly intruding. On the other hand, if one would achieve the purely sanitary ideal, one finds oneself outstepping the practical, as the sanitary ideal essentially involves disregarding labour and other costs. The only possible course is a compromise between sanitation and labour saving, with due regard to the relative utility of each to the industry.



ELEVATION SHOWING HOW ROOF AT REAR OF BAILS IS SUPPORTED ON BRACKETS.

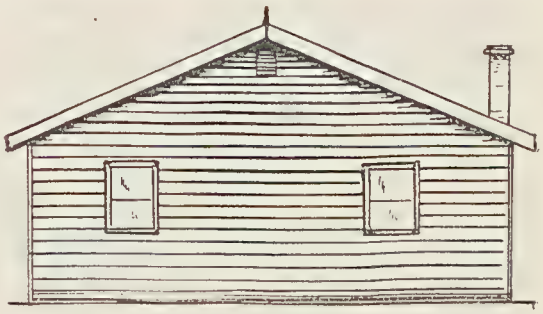
Return Bail Type.

In the production and treatment of milk certain buildings are necessary. One of these is the milking shed. This may or may not have feeding accommodation, but as good dairying is always likely to include hand feeding at longer or shorter intervals, according to the year's weather conditions, the complete milking shed for Victoria must be one which lends itself to convenience



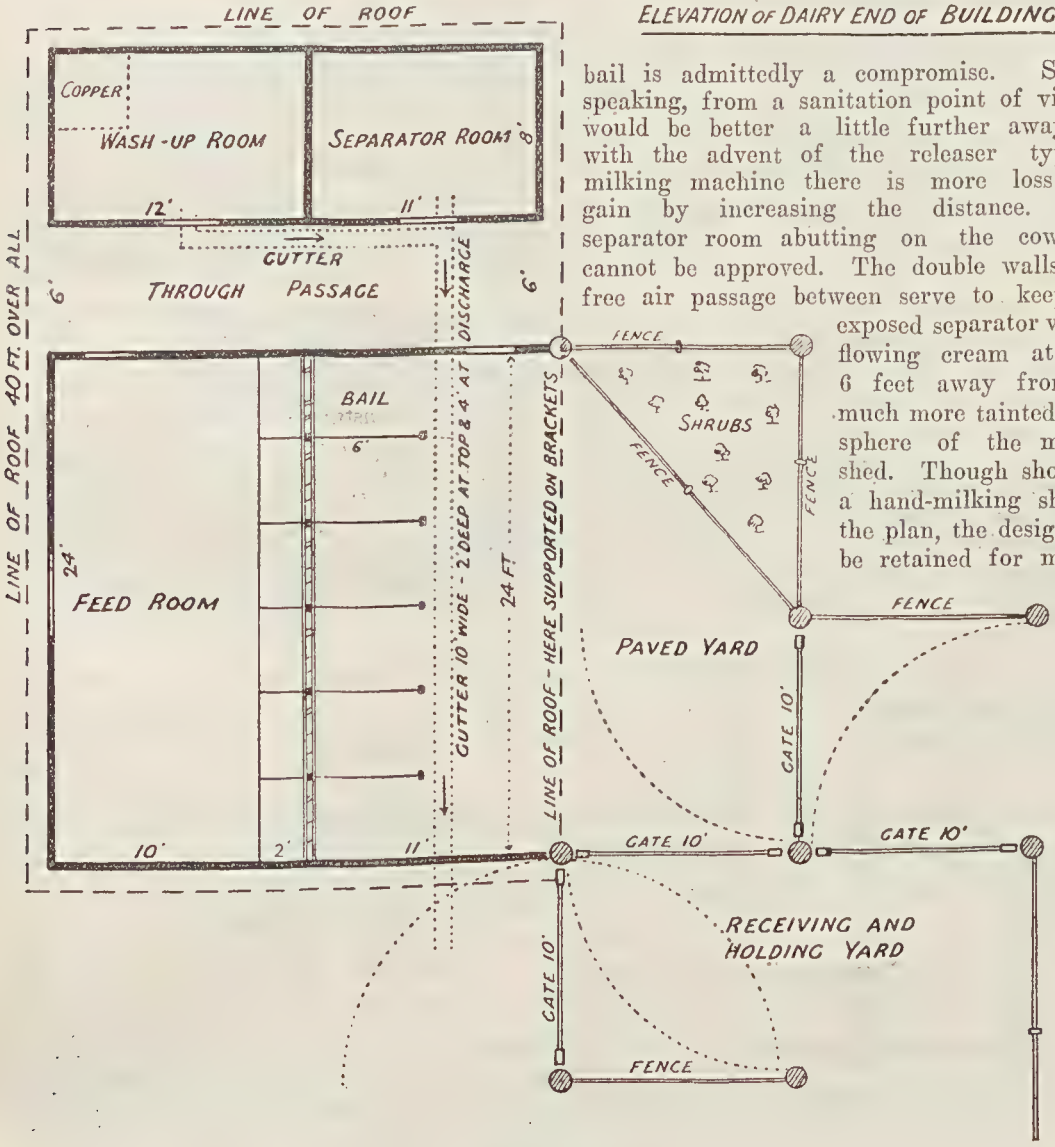
ELEVATION (FROM REAR OF BAILS.)

of manger feeding. A plan of such a shed is shown, the feed room with a brick floor which, made a little concave, can be used as a mixing floor, being immediately in front of the bails where it is most convenient for its purpose. If cows are to be fed the most economical place to feed them is in the milking bails. The plan, of course, involves the return bail instead of the walk-through type, but this need be no disability at all. The inclusion of the separator room within 6 feet of a cow



ELEVATION OF DAIRY END OF BUILDING.

bail is admittedly a compromise. Strictly speaking, from a sanitation point of view, it would be better a little further away, but with the advent of the releaser type of milking machine there is more loss than gain by increasing the distance. The separator room abutting on the cow stall cannot be approved. The double walls with free air passage between serve to keep the exposed separator vat and flowing cream at least 6 feet away from the much more tainted atmosphere of the milking shed. Though shown as a hand-milking shed in the plan, the design may be retained for milking



Ground Plan.

machine use with the omission only of every second bail division. Adaptation for machine use would entail, of course, a small additional room for the engine and pump.

Shed design for milking machines embodies three conditions that have now been made indispensable, viz., (*a*) a walled passage 6 feet wide, with open ends, between the cow stall and separator or cooling room (as case may be); (*b*) no bends in the milk line; and (*c*) the machinery in a room apart from the separator.

Quantities and Material for Cow Shed (Return Bail Type).

Split Messmate blocks		40 about 5″ square 1′ 9″ long.
Hardwood—		
4 x 2	For bottom plates	2/15, 5/13, 5/12, 1/9.
	„ top plates	2/16, 4/14, 2/12.
	„ bail fronts (horizontal)	8/13.
	„ feed-box studs	3/12 (to be sawn in three and placed 1 foot in floor).
	„ wall studs	4/16 (each to make two, for the short walls).
	„ „ „	4/14, 8/12, 8/10.
4 x 4	„ corner and end studs	8/8.
	„ back bail posts	6/12 (to be let in ground at bottom).
	„ foundation blocks.	
4 x 1½	„ partition and extra outer wall studs	1/16 (to make two), 5/14, 2/12, 2/10.
	„ door frames and window frames, &c.	8/14.
3 x 2	„ wall purlins	10/13, 10/12, 4/9.
	„ bail rails	5/14 (to make two each), 5/9 (bottom rail to under feed box).
	„ bail stanchions	12/10 (each to make two, the moving stanchion to be a few inches longer than the others).
	„ feed box cross stays	2/12 (each to make three).
5 x 1½	„ rafters	26/14 (allowing overlap of about 18 inches in all).
3 x 1½	„ roof purlins	10/16, 20/14 (five rows altogether).
4 x 3	„ front bail posts	5/16 (or longer if much ground slope) to be sunk 1 foot in ground.
9 x 1	„ feed box floor and sides	10/12 (two to form back, four in bottom and four in front).
8 x 1	„ ridge boards	3/14.
7 x 1	„ barge boards	4/16 (sides).
6 x 1	„ „ „	4/16 (tops).
x 1	„ braces	19/16 (including brackets under roof at rear of bails).
Weatherboards		16/12 (to line wall in extreme left bail to protect iron).
White Baltic, T. and G.—		
6 x ⅞	For 3 doors	12/13 (doors to be 6′ 6″ x 2′ 6″).
6 x ½	„ lining of separator room	36/16, 44/11 (ceiling boards to be on rafters throughout).

1 fly-proof wire door with hinges and spring.

Galvanized Iron Corrugated Sheets—
108/8 (40 for roof and 60 for walls up to eave, 40/7 (all for roof).
28/5 (for upper or gable portion of 4 cross walls).

Spouting—18 lengths 5″ O.G.
Ridging—7 lengths 16″ 26-gauge.
Downpipe—5 lengths 3″ (to go across end of building).
Spout brackets—52.
1 window—4′ x 2′ 4″ in frame (2 single lights) with cords and weights.
2 window sashes—3′ 10″ x 2′ 4″ x 1½′, each containing 4 lights.
3 rim locks.
3 pair T hinges—14″.
Galvanized fly-wire gauze—2′ 6″ x 6′.
16 packets spring head nails.
Tank—750 gallons.
Copper—Not less than 16 gallons.
Cement—22 bags.
Bricks—3,900.
Building lime—2 bags.
Sand.
Nails.

Points about Construction.

Though the drawn design shows weatherboard walls, the quantities furnished are for galvanized iron walls (because of relative cheapness), and assume the following points of construction, viz.:—Ground blocks 3 feet apart. The floor assumed is of grouted brick, but concrete may be substituted if conditions favour. Ground plates to be

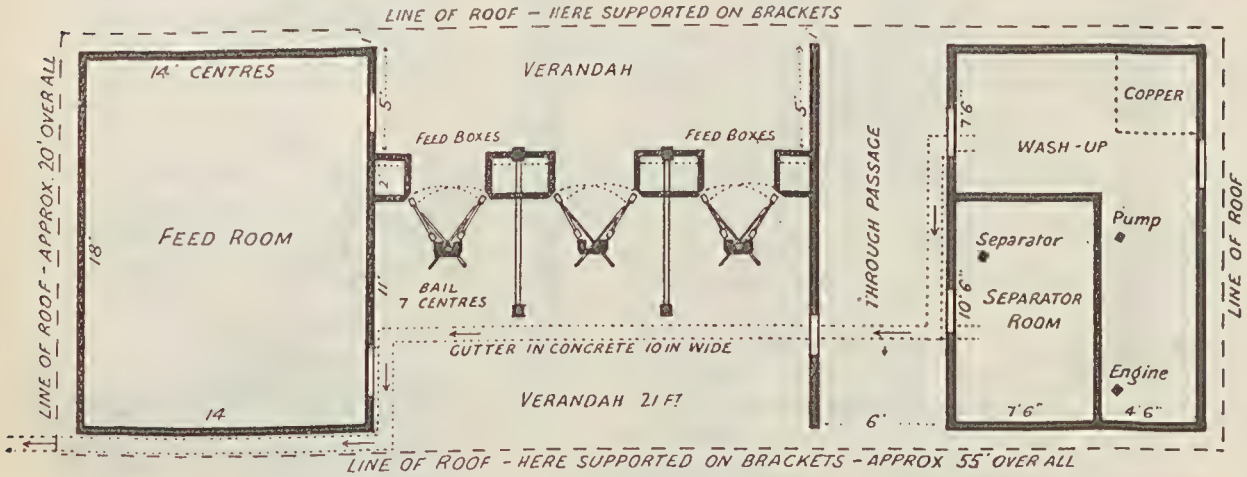
set 6 inches above ground-level (a relatively level ground site is assumed). Iron in all side walls to be set 6 inches below both top and bottom plates for ventilation. Walls to be 8 feet high from ground-plate, with a 6-in. opening between top of iron and top plate for ventilation. Gable to be 5 feet above top wall-plate. Wall studs (4 x 2) to be spaced at most 4 feet all round, and then, in separator room (which is lined), an extra stud 4 x $1\frac{1}{2}$ is to be interposed between each 4 x 2 to stiffen the lining.

Two rows of horizontal wall purlins (of 3 x 2—to take the iron, one half way up and the other 6 inches below the top wall plate). In the gables another row is necessary about half way between top wall plate and peak. Top wall-plates all around are assumed, but in the cross walls the 3 x 2 wall purlins may be substituted. The two gables of the milking-shed section to be left open for 2 feet at the apex for ventilation. The lining material for the separator room includes the ceiling carried up along rafters and thus sloping. (Fibro cement sheets may be substituted for T. and G. if preferred). Floor of wash-up and separator room to slope slightly to passage—the drainage to come through the respective doorways. It is well to mount the bottom wall-plates of, at least, the wash-up and separator room on an elevated flange of brick-work or concrete, turned up from the floor about 6 or 8 inches high to keep the plate away from water. If this is done, so many less foundation blocks will be required, and this amount should be deducted from the stated number in ordering. The grouting for brick floor to be in proportion of 3 parts sand to 1 part cement; bricks to be spaced at least $\frac{1}{4}$ inch to take the grouting.

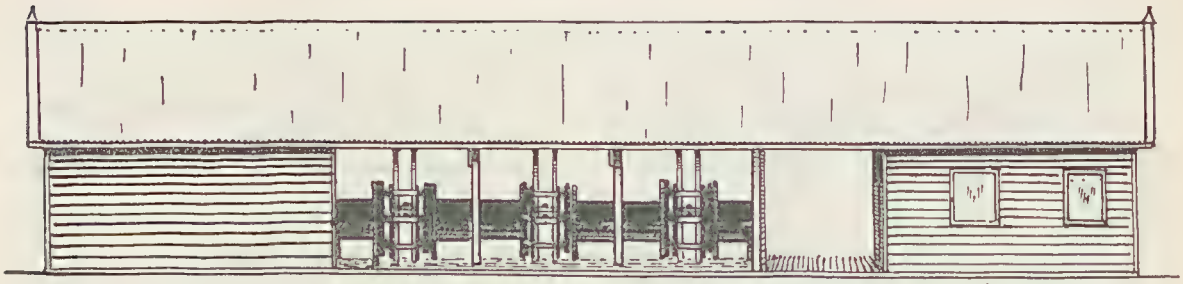
The window and door of separator room to be fly-wired. Foor of feed room to be of grouted brick and hollowed slightly towards middle to prevent undue spreading of water when wetting feed. If an engine is installed for power purposes, such as for milking machines, &c., an additional room (which may adjoin) for the machinery would be necessary. Bottom cross-pieces (containing bottom of bail stanchions) to be 1 foot clear above floor to facilitate the sweeping of floor. The end at which the separator room, &c., is placed is optional, but should always be, of course, the higher end. Adaptation of plan to meet this will be simple to any carpenter. The cows should face west and uphill if practicable.

Walk-through Type.

Because of the frequent requests for a cow shed on the walk-through principle (in which the cows make their exit through the front of the stall) a plan of this type of shed is furnished. A milking shed of this type owes its popularity to what must be regarded as a retrogressive tendency on the part of the dairy-farmer. It practically presupposes a very limited amount of manger or hand feeding. With the increasing use of the milking



Ground Plan.

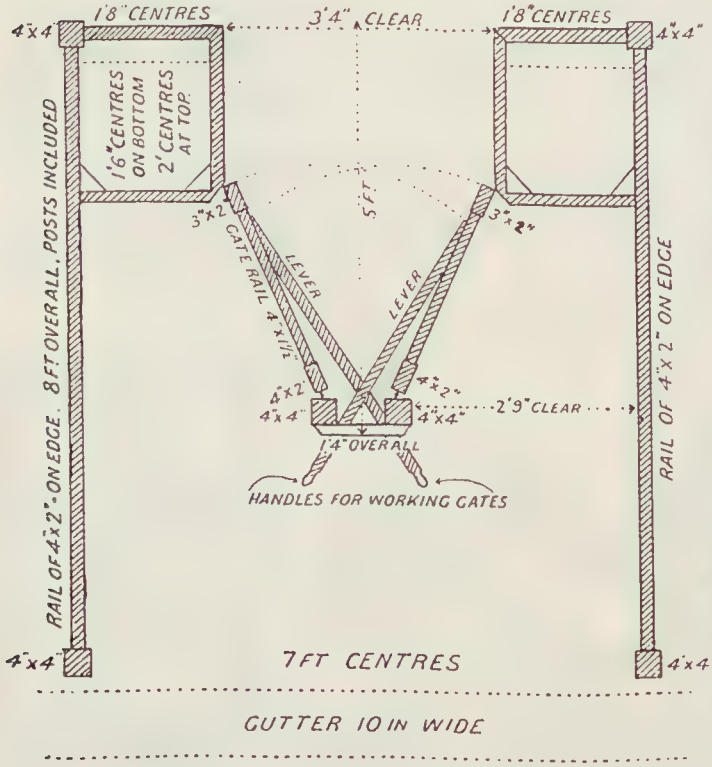


ELEVATION—VIEW FROM REAR OF BAILS.

machine dairymen would seem to be committed to the doubtful aim of getting the cows out of the bails as soon as possible. This may mean some saving of time in milking, but it also means some loss of feeding economy, for, although the design of walk-through shed shows means of feeding, it has to be admitted that the facilities are not so great as in the shed previously dealt with.

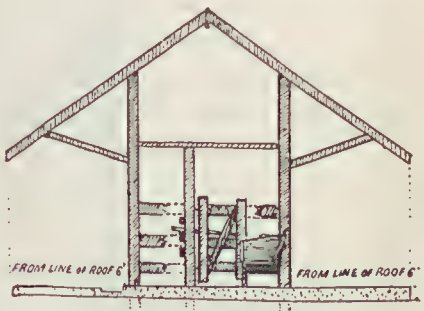
In both designs the principle has been introduced of dispensing with all supporting posts behind the stalls, brackets being provided instead. This obviates the accidents and injuries so commonly due to the animals bumping themselves against obstructing back posts in their passage to and from the bails.

Another feature observed is the drainage gutter close up behind the cow, where it best



Detail Construction of Walk-through Bail.

END ELEVATION (DAIRY END)



SHOWING BAIL ARRANGEMENT AND BRACKETED RAFTERS OVER SAME.

serves its purpose. A gutter that is too far rearward allows the urine to spread well over the floor before receiving it, and as bail floors must necessarily be of a hard and smooth nature, this makes for accidents where floors are allowed to become wet just at the critical point of entrance to the stall.

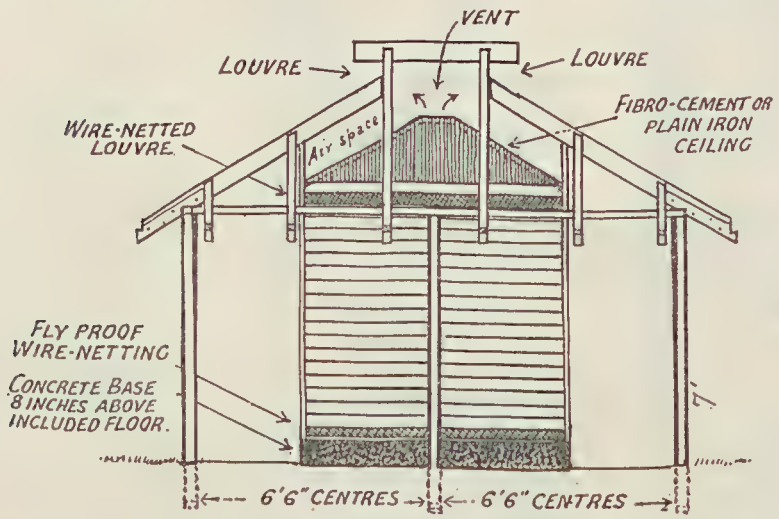
Which end of the milking shed the dairy buildings are to occupy should be determined by the direction of the ground-fall. The dairy should always be given the higher end, and the shed drainage the opposite and lower. The plan is quite easily adaptable to meet such requirements.

Quantities and Material for Cow Shed (Walk-through Type).

Split Messmate blocks		60/1′ 9″ about 5″ square.
Hardwood—		
4 x 3	For Gate heads (big end)	2/14.
4 x 2	„ Top Plates (lengthwise)	2/16, 2/12.
	„ „ „ (crosswise)	6/11, 5/8.
	„ Bottom Plates (lengthwise)	2/15, 2/12, 1/9.
	„ „ „ (crosswise)	6/11, 5/8.
	„ Studs	5/16 (each to make two), 5/14, 10/12, 10/10.
	„ Rafters	32/13.
	„ Bail Rails	3/16.
	„ Crossties and brackets	6/16, 3/12.
	„ Gate heads (small end)	2/14.
4 x 4	„ Corner and end studs	12/8.
	„ Back and front bail posts	4/12.
	„ Gate posts (in bails)	6/9.
4 x 1½	„ Studs (interposed for lining separator room)	1/16 (to make two), 8/14, 2/12, 2/10.
3 x 2	„ Wall purlins (around walls for iron)	4/16, 4/14, 25/10.
	„ Short rails across double gate posts	1/12.
	„ Feed box frames and legs	3/14.
3 x 1¾	„ Roof purlins	40/16.
3 x 1	„ Stays	18/16.
7 x 1	„ Ridge boards	4/14.
	„ Barge boards	4/14.
6 x 1	„ „ „	4/14.
9 x 1	„ Feed box sides and bottoms	5/12.
White Baltic, T. and G.—		
6 x ½	For lining separator room	64/12, 47/16.
6 x ⅞	„ Making doors (3)	12/13.
1 Fly-wire door, with spring and hinges		6′ 6″ x 2′ 6″ (big).
4 Pair T hinges 14″		
3 Rim locks.		
1 Window, 4′ x 2′ 4″ in frame, containing two single pane sashes with cords, &c.		
2 Window sashes, 3′ 10″ x 2′ 4″ x 1½″, each containing 4 lights.		
Galvanized Corrugated Iron—		
For Roof		56/7, 56/6, (26 gauge).
„ Walls		75/8, 35/6 (26 gauge).
Spouting		20 lengths, 5″ O.G.
Ridging		10 lengths, 16″.
Down pipe (to be used across building)		4′ lengths, 3″.
Spring-head nails		18 packets, and other nails.
Cement		20 bags.
Bricks		3,300.
Sand		4 cubic yards

Points on Construction.

Though the drawn design shows weather-board walls, the quantities furnished are for galvanized walls because of relative cheapness, and assume the following points of construction, viz.:—Ground blocks 3 feet apart. The floor assumed is of grouted brick, but concrete may be substituted if conditions favour. Ground plates to be set 6 inches above ground (a relatively level ground-site is assumed). Iron in all the side walls (under the eaves) to be set down 6 inches from top-plate to allow of better ventilation. Walls to be 8 feet high from the ground-plate. Wall studs (4 x 2) to be spaced not more than 4 feet all round, and then in outer walls of separator room (which is lined) an extra stud 4 x 1½ is to be interposed between each 4 x 2 as stiffening for the lining. The lining for separator room includes ceiling, carried up along rafters and thus sloping. If fibro-cement sheets or plain galvanized iron is preferred for lining of separator room, it may be adopted instead of the baltic. Two rows of horizontal wall purlins (3 x 2) are required below the top plate—one about half way up and the other 6 inches from the top of studs. In the gables another row is necessary about half way up to peak. Gable to be 5 feet higher than top wall plates. Top wall plates are assumed all around but in the cross walls the 3 x 2 being used as a wall purlin may serve both purposes, if preferred. The apex of each gable in the cowshed section to be left open for 2 feet or more for ventilation.



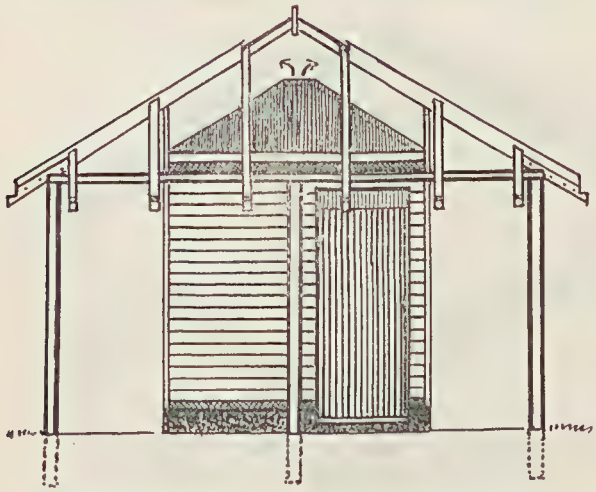
Elevation (Side View) with roofing removed to show construction.

Floor of wash-up and separator room to have fall of about 1 in 100 to passage—the drainage to come through the respective doorways. It is well to mount the bottom wall-plates of, at least, the wash-up and separator rooms, on an elevated flange of brickwork, or concrete turned up from the floor-level about 6 or 8 inches high to keep the wooden plate away from water. If this is done, so many less foundation blocks will be required, and should be allowed for in ordering. (The stated number assumes no use of floor concrete for supporting plate). The grouting for brick floor to be 3 of sand to 1 of cement, and the bricks to be spaced ¼ inch to take the grouting. (The feed room is being left unfloored in estimates). The window of separator room to be fly-wired, and door to be fly-wired and self-closing. The separator room and its appurtenances should always be placed at the higher end of the building. Adaptation of this plan to meet this will be simple to any carpenter. The cows should face west and uphill if practicable.

Cream Storage Room.

With regard to the separator room under the same roof as the milking bails, it should be pointed out that this is not intended for cream storage. The aim approved is to get the milk out of the cow shed atmosphere and the cream out of the separator room as quickly as possible. The closeness of the separator room to the cow bails can be approved only on this assumption—quick removal of the cooled cream to a more suitable storage in an environment cleaner than is practicable in the surroundings of cow yards.

A dairy or cream storage room has been designed for this purpose. This has been designed for coolness—a very essential thing where the main object is to prevent a rise of temperature in cream that one has taken the trouble to cool. Much of the efficacy of this building will be lost if it is plumped down in an unclean environment open to access by fowls, dogs, cats, and



Elevation (Front View) with roofing removed to show construction.

other animals. It calls for a clean environment, and should be enclosed by a fowl and animal-proof fence at some distance out from the walls and with the intermediate space planted with ornamental trees or shrubs. To make a perfect job the enclosure should have a row of shelter trees just inside the fence to keep down dust, and the space between these and the dairy sown down with grass. This grass, kept down in the nature of a lawn, gives a very pleasing and cool effect to the whole structure. A clean dust-free atmosphere is very desirable surrounding a dairy, for obviously ventilators cannot be entirely closed in any weather, and least of all in hot days when, as it happens, dust is at its worst.

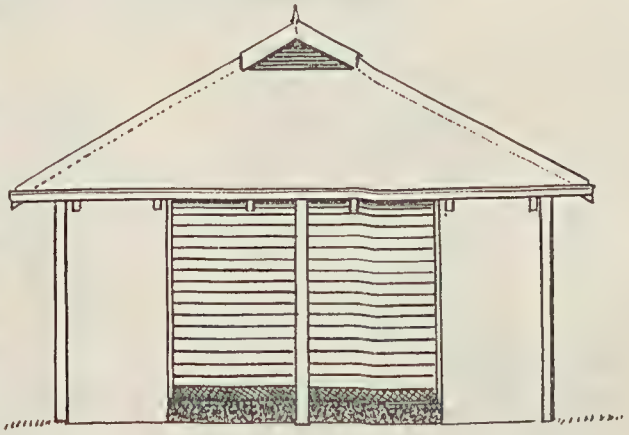
An ideal material for use in the walls of this building is fibro-cement. In the list of quantities and specifications weatherboards have been allowed for, but cement sheets might be substituted with advantage.

Points about Construction.

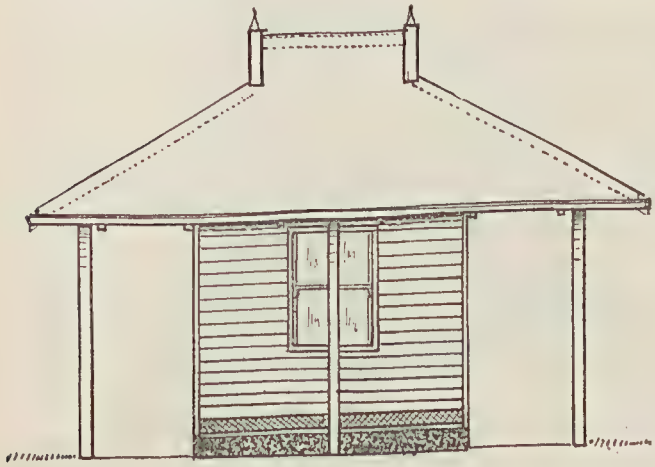
The given quantities assume that the external walls of the dairy are of weatherboard, the external roof of iron, and that the internal lining, including internal roof (or cove-ceiling), is of plain galvanized iron, which serves for both roof and ceiling of the chamber. The quantities also assume a floor of grouted bricks, but concrete may be substituted if preferred. The air-space between the roofs to be not less than 9 inches; the wire netting is for closing this space from access of birds. The design provides for 6 inches of fly-wire all around at both top and bottom wall-plates, but this may need reducing in dusty districts and a hinged drop-shutter provided, as well for bottom vent on each side.

The wall-plate of verandah to be 7 feet from ground.

The verandah posts to be let 1 foot in ground.

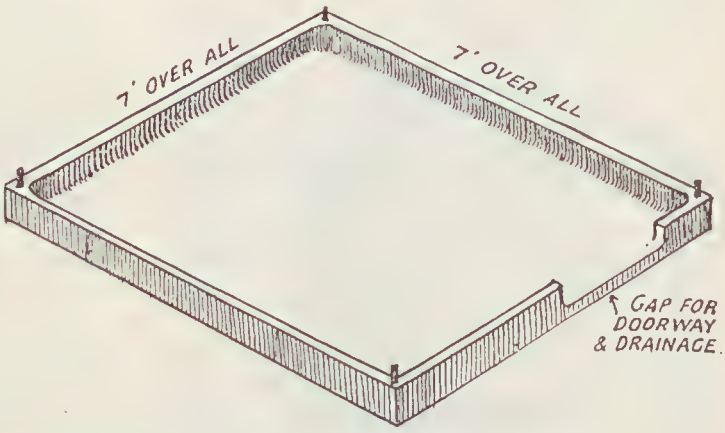


Elevation (Side View).



Elevation (Back View).

The size of dairy (7′ x 7′) should be taken from centre to centre, making the internal size 6′ 8″ x 6′ 8″. If this is not observed, the lining as ordered will not quite fit. If the weatherboard stops at each corner are carried up to the outer roof, to brace the outer and inner structures together, no further braces for this purpose should be necessary, except in windy districts, in which case a few horizontal stays across from one building to the other would be advisable, to steady the roof.



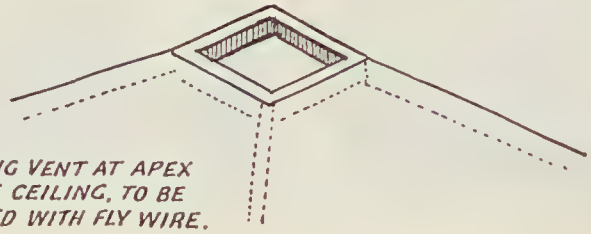
Showing raised edge of floor in concrete ready to receive wall plates and inset bolts for same.

Quantities and Materials for Cream Storage Room.

				Order.	
Hardwood—					
4 x 4	For Verandah posts	8/8		8/8	4 x 4
4 x 2	„ Top and bottom wall plates	4/16 (each to be halved)		8/16	4 x 2
	„ Top verandah plates	4/16			
4 x 1½	„ Wall studs	12/16			
	„ Roof rafters	16/10		16/16, 4/12, 16/10	4 x 1½
	„ Ties	4/15, 2/12			
	„ Window frames and door frames, &c.	2/12			
3½ x 2	„ Ceiling rafters	5/10		5/10	3 x 2
3 x 1½	„ Purlins	4/17, 8/14		4/17, 8/14, 4/10	3 x 1½
	„ Corner stops	4/10 (each to make two)			
8 x 1	„ Ridge boards	5/12		5/12	8 x 1
7 x 1	„ Barge boards	2/16		2/16	7 x 1
3 x 1	„ Ties	4/12		4/12	3 x 1
Weatherboards		32/16		32/16	Weatherboards
Baltic, White, T. and G.—					
6 x ⅞	For door	4/13		4/13	6 x ⅞

1 pair casement sashes—16 oz. glass, each 3′ x 1′ 6″ x 1½″, rebated to fit, with hinges and catch.
Cement—2 bags.
Bricks—300.
Galvanized Iron—
Corrugated, for roof (26 gauge)—18/9 sheets.
Plain, for lining (24 gauge)—11 sheets, 7′ x 2′ 6″ for walls, and 4 sheets 8′ x 2′ 6″ for ceiling.
Spouting—11 lengths, 4″ O.G., with 24 brackets to fit.
Down pipe—2 lengths 2½″ diameter.
Ridging—7 lengths, 16″.
Spring-head nails—2 packets.
Fly-wire, galvanized—16′ of 2′ 6″.
Wire netting (to exclude birds between roof)—54 sq. ft. ½″ mesh.
T hinges—1 pair 12″.
1 Rim lock.

Approximate cost of above material £24, plus freight and cartage.



SHOWING VENT AT APEX OF COVE CEILING, TO BE COVERED WITH FLY WIRE.

Export of Citrus Fruit

Committee's Recommendations

THE following recommendations as to the procedure to be followed in the handling of citrus fruit for export have been made by the Citrus Preservation Committee of the Council for Scientific and Industrial Research. This committee consists of Messrs. W. J. Young, D.Sc., Associate Professor in Biochemistry, University of Melbourne (Chairman); W. D. Bracher, Superintendent of Refreshment Rooms, Victorian Railways; Captain D. Halhed, Victorian Central Citrus Association; Messrs. G. E. Kitchin-Kerr, Victorian Central Citrus Association; J. Hepburn, Works Manager and Chief Engineer, Government Cool Stores, Melbourne; F. M. Read, M.Agr.Sc., Senior Horticultural Research Officer, Department of Agriculture, Victoria; W. Ranger, Committee of Direction of Fruit Marketing, Queensland; and Miss E. Archer, M.Sc., Council for Scientific and Industrial Research, secretary. The recommendations are:—

A. **Regulations Affecting Export.**—All fruit must comply with the regulations under the Acts dealing with the overseas export of fruit and in particular those relating to the control of the quality and the grading of the fruit, the type of case, and the markings on the case.

B. **Type of Fruit.**—In view of the fact that the regulations set out in detail the type of fruit permitted for export, there is not much that can be added under this heading. It is only necessary to emphasize that only first quality fruit should be sent. The harmful effect on the trade would be very great if sour or immature oranges were included.

C. **Methods of Handling in Grove.**—During all operations it is most important to avoid injury to the rind. All experiments have definitely pointed to the necessity for great care in the handling of the fruit. Considerable loss is produced by mould infection following damage to the rind, and this damage can be prevented by careful handling in the following manner:—

(1) Gloves should be worn during all operations of harvesting, grading, and packing.

(2) Under no circumstances should the fruit be pulled from the tree.

(3) Blunt-nosed clippers should be used, and in the actual cutting of the fruit the greatest care must be taken that no protruding stalk be left. It may be necessary to make a second cut in order to remove any superfluous wood.

(4) No fruit resting on the ground or hanging within a foot from the ground should be used for export.

(5) The fruit should not be harvested in damp weather.

(6) Picking-bags are not recommended as the ideal receptacle, because in a bag the oranges are liable to be rubbed together and the rind bruised by the movements of the packers. It is strongly recommended that growers make an effort to provide the pickers with a box of the capacity of half a bushel; the box should be well padded inside, and have straps for hanging across the shoulder.

(7) Care should be taken to see that the fruit is not dropped, but transferred from one receptacle to another with the same care as would be given to eggs. If any orange is accidentally dropped or mishandled in any way during the operation it should be immediately rejected, as otherwise it may be the means of ruining a whole case of fruit.

(8) The most suitable type of field box is the box used in the canning industry, namely, a kerosene case cut open on one side with cleats nailed to each end for ease of handling.

(9) Care should be taken to see that the field boxes have no inner surface projections of any kind; there should be no nails, protrusions of wood or sharp knot holes, all of which are liable to cause injury to the rind.

(10) If the weather is dry and warm, sweating in a well-ventilated shed is recommended for a period of up to seven days. Under moist conditions, however, sweating will be quite ineffective, and therefore is not advised, unless some chamber in which atmospheric conditions can be controlled is available.

(11) In transporting the fruit from the grove to the shed care should be taken to pack the boxes squarely on top of each other, and the truck should be driven carefully so as to minimize the shaking as much as possible.

D. Packing House Methods.—The importance of scrupulous cleanliness in the packing sheds and of all parts of the machinery used cannot be over-emphasized. To ensure this, the following precautions should be taken:—

(1) Old fruit should not be left lying about. All mouldy or damaged fruit should be removed from the shed and destroyed.

(2) The grading machine should be sprayed daily with a formalin solution of 1 part of 40 per cent. commercial formalin to 20 parts of water.

(3) Where practicable, the whole of the shed should be sprayed at intervals with this solution. The floor in the vicinity of the packing operations should always be regularly sprayed.

(4) Gloves should be worn during all sorting, grading, and packing.

(5) It is important that the grading machine should be free from all rough, sharp edges or projections, or surfaces which might injure the fruit.

(6) It is essential that the fruit should be carefully culled, and that any which shows marked signs of blemish should be rejected. Off type fruit should be rigorously excluded.

(7) Dirty fruit should under no circumstances be exported. Cleaning may necessitate washing and polishing, and unless the proper facilities exist for efficient washing and quick drying of the fruit washing should not be attempted, and all dirty fruit should be discarded. Where proper facilities for washing exist, the sodium bicarbonate treatment is recommended, as it is beneficial for reducing the decay due to moulds. This consists in immersing the fruit in 5 per cent. sodium bicarbonate for eight minutes at temperatures of 112-120 deg. F. and drying on towel dryers. A full description of the methods was published in the Council's Journal, vol. 3, No. 2, May, 1930, copies of which may be obtained from the secretary, Council for Scientific and Industrial Research, 314 Albert-street, East Melbourne. For efficient drying after this treatment loose towels should be placed on the fruit as it passes over the revolving towel dryer. The revolving towel soon becomes so wet that it does not dry the fruit, but merely removes the excess of moisture. If dry towels be tacked on the machine so that they rest loosely on the fruit, the efficiency of the apparatus is increased enormously, and the fruit can be actually dried. These loose towels, which should be made to fit the machine, need to be changed and dried as soon as the condition of the fruit points to the necessity.

(8) Only export citrus cases (23 x 11½ x 11½, inside measurements, clear of a division) should be used. The space between the side boards must not be more than ½ inch. Each case should be dressed particularly on the inside, and be free from projecting nails, loose splinters, or anything that might injure the fruit.

(9) In packing, great care should be taken to see that the fruit is to the correct height in the case in order that "lidding" can be carried out without damage to the fruit. The use of box guards on the middle division piece and round the inside is recommended during "lidding" in order to prevent injury.

(10) The experiments of the committee have not as yet gone far enough to recommend a definite method of wrapping. It is considered, however, that wrapping in an attractive paper is advisable in that it enhances the selling qualities very considerably.

E. Transport by Rail.—The cases should be carefully packed in a railway truck in such a way that undue movement is prevented. They should be stacked on end, and for preference should be battened, but if battening is impracticable the cases should be stacked in such a way as to prevent movement as far as possible. Cleanliness in the trucks is as essential as in the packing sheds.

F. Precooling.—Broadly speaking, all fruit consists of living matter and materials which have been stored up in the fruit during the period of growth on the tree.

After the removal of the fruit from the tree, the living matter is dependent for its maintenance upon the materials stored up, and when these are used up the fruit dies.

The life of the orange, therefore, is limited, depending upon the quality of stored material and on the rate at which this material is used up.

The vital activity of the fruit depends upon its temperature, increasing with rise of temperature at an accelerated rate, and the object of storage at a low temperature is to reduce its rate of living, and so prolong the life of the fruit.

This using up of stored material is accompanied by actual production of a proportional quantity of heat, and so if the fruit be loaded hot into the ship's hold, the refrigeration machinery has to remove not only the heat already in the fruit, but also heat which is constantly being produced. It may, therefore, be some time after loading before the temperature at which it is desired to carry the fruit is attained throughout the stack. This means that the life of much of this fruit is shortened.

All fruit should, therefore, be precooled to 40 deg. F. before being loaded into the ship, since precooling lowers the rate of living and thereby lengthens its life.

As oranges have only a limited life, it follows that all time taken up after picking, sweating, packing, &c., is so much time taken off the storage life of the fruit, which really starts when the fruit is removed from the tree.

It is, therefore, essential that the fruit should reach the precooler as soon as possible after picking, so that the vital activity, and therefore the reduction of its stored material, are reduced to a minimum.

G. Ship Transport Conditions.—The temperature of storage on the ship should be 38 deg., and the holds should be subject to periodical ventilation.

General Instructions.—It has already been stated that the life of the fruit from the time it leaves the tree is strictly limited, and any unnecessary delay between the time of harvesting and the time of sale means a shorter time during which it will be in good marketable condition.

It is, of course, manifestly impossible to make arrangements for a shipment of any size without at least some of the fruit having been harvested earlier than the rest. As, however, the process of decay is very much slower when once the fruit is in cool storage, it is essential that the actual processes of harvesting, washing, packing, and transport to the cool stores must be managed as expeditiously as possible. If the fruit must be held for some time before shipment, it should be held in cool store, and not in the packing shed.

Potato Manurial Trials

By J. T. Ramsay, Potato Expert.

WHEATSHEAF.

DISAPPOINTING yields were obtained last year on the potato experimental plots conducted by the Department at Wheatsheaf, on the farm of Messrs. J. Gooch and Sons. The soil here is a red volcanic types. The rainfall during the season was adequate in total, but unsuitable in its incidence, for the growth of a heavy crop. However, the percentage increases from manures were material, ranging from 22 per cent. to 55 per cent. over the unmanured plot. (See Table I.).

TABLE I.—POTATO MANURIAL TRIALS, WHEATSHEAF, 1929-30.

Plot.	Manures.	Market Tubers.	Increase from Manures.	Cost of Manures per Acre.	Cost per Ton Increase.	Increased Value per Acre.	Net Increased Value per Acre.	Percentage Increase.
		T. c. q.	T. c. q.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	%
1	2 cwt. super.	2 15 0	0 10 0	0 9 6	0 19 0	2 10 0	2 0 6	22
2	3 cwt. super.	3 10 0	1 5 0	0 14 3	0 11 4	6 5 0	5 10 9	55
3	4 cwt. super.	3 0 0	0 15 0	0 19 0	1 3 9	3 15 0	2 16 0	33
4	No manure	2 5 0	..	..	..	..	..	..
5	3 cwt. super., 1 cwt. ammon. sulph.	2 15 0	0 10 0	1 7 0	2 14 0	2 10 0	1 3 0	22
6	3 cwt. super., 1 cwt. ammon. sulph., 1 cwt. pot. sulph.	2 15 0	0 10 0	2 1 6	4 3 0	2 10 0	0 8 6	22
7	3 cwt. market garden manure ..	3 0 0	0 15 0	1 5 6	1 12 0	3 15 0	2 9 6	33
8	3 cwt. basic phos.	2 17 2	0 12 2	0 16 6	1 7 6	3 2 6	2 6 0	26

Values calculated at £5 per ton.

Table II. gives the average result in weights per acre for two years since the manurial rates were reduced at this station. It is interesting to note that the moderate rating of 3 cwt. super. per acre is giving the best result so far, but, of course, this will have to be investigated further before it can be stated definitely to be the optimum manurial rating for this class of soil. So far, however, it confirms previous findings that the soils of the red volcanic belt do not give a profitable response to heavy dressings of artificial manures as do those of Gippsland with its heavier rainfall.

TABLE II.—AVERAGE RESULTS, TWO YEARS.

Season.	1. 2 Cwt. Super. per Acre.	2. 3 Cwt. Super. per Acre.	3. 4 Cwt. Super. per Acre.	4. No Manure.	5. 3 Cwt. Super., 1 Cwt. Ammon. Sulph. per Acre.	6. 3 Cwt. Super., 1 Cwt. Pot. Sulph., 1 Cwt. Ammon. Sulph., per Acre.	7. 3 Cwt. Market Garden Manure per Acre.	8. 3 Cwt. Basic Phos. per Acre.
	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.
1928–29	1 13 3	1 13 3	1 10 0	0 7 9	1 13 3	..	1 4 0	1 1 3
1929–30	2 15 0	3 10 0	3 0 0	2 5 0	2 15 0	2 15 0	3 0 0	2 17 2
Average 2 years	2 4 1	2 11 3	2 5 0	1 6 0	2 4 1	..	2 2 0	1 19 2
% Increase	70%	99%	73%	..	70%	..	61%	52%

MUSK.

The results from last season's trials at Musk, about 6 miles from Wheatsheaf, in the Daylesford district, were distinctly more in favour of the manured plots than those of Wheatsheaf. On analysis, the volcanic soil on these plots, which are located on the farm of Mr. E. Bull, is considerably richer in plant food than that at Wheatsheaf, and the greater improvement from manuring during the season 1929-30 is accounted for by the fact that the Musk district benefited from heavy rainstorms (amounting to 2 inches) in early February, which were purely local. In spite of the high plant food analysis of this soil, the mixture showing most outstanding benefit to the crop is that of super. and ammonia, at the rate per acre of 3 cwt. super. and 1 cwt. sulphate of ammonia. This manurial rating during last season gave the substantial increase of 72 per cent. over the unmanured plot.

This station gave another illustration not only of the failure of potash to improve the crop yield, but of its actual depressing effect on the weight of crop harvested.

Table III. gives the figures for 1929-30 crop, the value being calculated at £5 per ton.

TABLE III.—RESULTS AT MUSK CREEK, SEASON 1929-30.

Plot.	Manures.	Market Tubers.	Increase from Manures.	Cost of Manure per Acre.	Cost per Ton Increase.	Increased Value per Acre.	Net Increased Value per Acre.	Per-centage Increase.
		T. c. q.	T. c. q.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	%
1	2 cwt. super.	4 10 0	1 5 0	0 9 6	0 7 6	6 5 0	5 15 6	38
2	3 cwt. super.	4 12 2	1 7 2	0 14 3	0 10 7	6 17 6	6 3 3	41
3	4 cwt. super.	4 10 0	1 5 0	0 19 0	0 15 0	6 5 0	5 6 0	38
4	No manure	3 5 0	..	..	..	..	..	..
5	3 cwt. super., 1 cwt. ammon. sulph.	5 12 2	2 7 2	1 7 0	0 11 8	11 17 6	10 10 6	72
6	3 cwt. super., 1 cwt. ammon. sulph., 1 cwt. pot. sulph.	5 2 2	1 17 2	2 1 6	1 2 4	9 7 6	7 6 0	57
7	3 cwt. market garden manure ..	4 7 2	1 2 2	1 5 6	1 3 4	5 12 6	4 7 0	33
8	3 cwt. basic phos.	3 17 2	0 12 2	0 16 6	1 7 6	3 2 6	2 6 0	18

Table IV. shows the average returns of the various manures for the past two years since the reduction was made in the rates of super. applications. The figures show markedly in favour of the 3 cwt. super. and 1 cwt. ammonium sulphate per acre combination.

TABLE IV.—AVERAGE RESULTS, TWO YEARS.

Season.	1 2 cwt. Super. per acre.	2 3 cwt. Super. per acre.	3 4 cwt. Super. per acre.	4 No Manure.	5 3 cwt. Super., 1 cwt. Sul. Amm. per acre.	6 3 cwt. Super., 1 cwt. Sul. Pot., 1 cwt. Sul. Amm. per acre.	7 3 cwt. Mkt. Gdn. Manure per acre.	8 3 cwt. Basic Phos. per acre.
	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.
1928–29	2 16 1	2 17 2	3 4 1	1 14 3	3 8 1	..	3 4 1	2 10 3
1929–30	4 10 0	4 12 2	4 10 0	3 5 0	5 12 2	5 2 2	4 7 2	3 17 2
Average 2 years	3 13 0	3 15 0	3 17 0	2 9 3	4 10 1	..	3 15 3	3 4 0
% Increase	46%	50%	54%	..	81%	..	52%	28%

ILLOWA.

At Illowa, where trials are conducted on volcanic soil on the farm of Messrs. Sheen Brothers, fairly good yields were obtained. The results for the season, as given in Table V., are definitely in favour of the "3 and 1" mixture, which gave an increase in crop of 81 per cent. over the unmanured plot. The

next best yield (from point of weight only) was where superphosphate, ammonia, and potash were applied (plot No. 6) in the proportion of 3—1—1; but this yielded 24 per cent. less than the ammonium and super. (plot No. 5).

TABLE V.—RESULTS OF MANURIAL TRIALS AT ILLOWA, SEASON 1929-30.

Manures.	Market Tubers.	Increase from Manures.	Cost of Manure per acre.	Cost per ton Increase.	Increased Value per acre.	Net Increased Value per acre.	Percentage Increase.
	T. c. q.	T. c. q.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	%
1. 2 cwt. super. per acre	5 7 0	1 12 3	0 9 6	0 5 8	8 3 9	7 14 3	44
2. 3 cwt. super. per acre	5 14 1	2 0 0	0 14 3	0 7 1½	10 0 0	9 13 9	54
3. 4 cwt. super. per acre	5 14 1	2 0 0	0 19 0	0 9 6	10 0 0	9 1 0	54
4. No manure	3 14 1	..	..	..	..	..	..
5. 3 cwt. super., 1 cwt. sul. amm. ..	6 14 1	3 0 0	1 7 0	0 9 0	15 0 0	13 13 0	81
6. 3 cwt. super., 1 cwt. each P.S. and A.S.	5 17 0	2 2 3	2 1 6	0 19 2	10 13 9	8 12 3	57
7. 3 cwt. market garden manure ..	5 10 0	1 15 3	1 5 6	0 14 2	8 18 9	7 13 3	48
8. 3 cwt. basic phos.	4 7 0	0 12 3	0 16 6	1 5 4	3 3 9	2 6 3	17

Values calculated at £5 per ton.

In Table VI., the averages of two years' results at Illowa are given, which again show to the advantage of the super. and ammonium dressing. It should be noted that in this table the complete dressing (No. 6 plot) was given at the rating of 3—1—1 during the past season only, and on that account probably shows to better advantage than it otherwise would do if two years' figures were available.

The advantage in favour of the super. and ammonium mixture at Illowa is not very marked on these two years' figures, but these ratings will be continued for some years so that it can be determined finally which combination, and what rate of this combination, per acre are likely to prove most profitable over a number of years.

TABLE VI.—RESULTS OF MANURIAL TRIALS AT ILLOWA, TWO YEARS.

Season.	1 2 cwt. Super. per acre.	2 3 cwt. Super. per acre.	3 4 cwt. Super. per acre.	4 No Manure.	5 3 cwt. Super., 1 cwt. Sul. Amm. per acre.	6 3 cwt. Super., 1 cwt. Sul. Pot., 1 cwt. Sul. Amm. per acre.	7 3 cwt. Mkt. Gdn. Manure per acre.	8 3 cwt. Basic Phos. per acre.
	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.
1928–29	5 3 3	5 12 0	5 6 2	3 9 0	4 15 2	*	4 5 3	4 8 2
1929–30	5 7 0	5 14 1	5 14 1	3 14 1	6 14 1	5 17 0	5 10 0	4 7 0
Average 2 years	5 5 1	5 13 0	5 10 1	3 11 2	5 14 3	5 17 0	4 17 3	4 7 3
% Increase	47%	58%	54%	..	60%	57%	37%	23%

* For one year only.

KOROIT.

The Koroit yields, though not heavy, show a marked improvement where manures are applied, and this notwithstanding the fact that analysis proves the soil to be high in all the essential plant foods. These plots are situated on a volcanic loam on the farm of Mr. J. Wilkinson. The only definite information gained in two years' experimental work at Koroit is that the soil there is responsive to moderate dressings of up to 3 cwt. super. per acre. Further work is necessary to ascertain what is the most profitable application.

TABLE VII.—POTATO MANURIAL TRIALS, KOROIT, 1929-30.

Manures.	Market Tubers.	Increase from Manures.	Cost of Manure per acre.	Cost per ton Increase.	Increased Value per acre.	Net Increased Value per acre.	Percentage Increase.
	T. c. q.	T. c. q.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	%
1. 2 cwt. super. per acre	5 4 1	2 1 1	0 9 6	0 4 7	10 6 3	9 16 9	65
2. 3 cwt. super. per acre	5 4 1	2 1 1	0 14 3	0 7 0	10 6 3	9 12 0	65
3. 4 cwt. super. per acre	5 0 0	1 17 0	0 19 0	0 10 0	9 5 0	8 6 0	58
4. No manure	3 3 0	..	..	..	..	..	..
5. 3 cwt. super., 1 cwt. sul. amm. ..	5 0 0	1 17 0	1 7 0	0 14 8	9 5 0	7 18 0	58
6. 3 cwt. super., 1 cwt. each P.S. and A.S.	5 10 0	2 7 0	2 1 6	0 17 8	11 15 0	9 13 6	74
7. 3 cwt. market garden manure ..	5 0 0	1 17 0	1 5 6	0 13 8	9 5 0	7 19 6	58
8. 3 cwt. basic phos.	4 17 0	1 14 0	0 16 6	0 9 8	8 10 0	7 13 6	54

Values calculated at £5 per ton.

The average results for two years for Koroit are given in Table VIII. As at Illowa, only one year's figures are available for the complete manured plot (No. 6).

With regard to these results on the rich soils of the Western District, it should be noted that both of the years for which figures are given have been years of low yield. This may account for the manurings not showing to greater advantage, as the conditions may have been adverse to their functioning completely. Further tests, however, will prove this.

TABLE VIII.—AVERAGE RESULTS, TWO YEARS.

Season.	1 2 cwt. Super. per acre.	2 3 cwt. Super. per acre.	3 4 cwt. Super. per acre.	4 No Manure.	5 3 cwt. Super., 1 cwt. Sul. Amm, per acre.	6 3 cwt. Super., 1 cwt. Sul. Pot., 1 cwt. Sul. Amm. per acre.	7 3 cwt. Mkt. Gdn. Manure per acre.	8 3 cwt. Basic Phos. per acre.
	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.
1928–29	2 17 0	2 17 2	3 8 2	2 1 2	3 8 2	*	2 17 0	2 17 0
1929–30	5 4 1	5 4 1	5 0 0	3 3 0	5 0 0	5 10 0	5 0 0	4 17 0
Average 2 years	4 0 2	4 0 3	4 4 1	2 12 1	4 4 1	..	3 18 2	3 17 0
% Increase	53%	54%	61%	..	61%	..	50%	48%

* For one year only.

WARRAGUL.

The returns from the Warragul plots have been very consistent over the period of four years during which they have been conducted. They are unique also, inasmuch as these are the only plots on which potash has shown profitable results when applied to the potato crop. The soil here is a clay loam, and the plots are located on the farm of Mr. S. Adkins.

Table IX. shows in detail an analysis of the results, taking into consideration the cost per acre of the various manurial dressings. It presents also, as is done in the case of the results of all other plots, the cost of each ton increase from the different manure ratings and the net increased value per acre. The actual tonnage of market tubers harvested from each combination of manure is shown together with the increases expressed both in weights and percentages.

TABLE IX.—RESULTS OF MANURIAL TESTS ON POTATOES, WARRAGUL, 1929-30.

Manures.	Market Tubers.	Increase from Manures.	Cost of Manure per acre.	Cost per ton Increase.	Increased Value per acre.	Net Increased Value per acre.	Percentage Increase.
	T. c. q.	T. c. q.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	%
1. 3 cwt. super. per acre	3 14 0	0 7 0	0 14 3	2 2 0	1 15 0	1 0 9	10
2. 6 cwt. super. per acre	4 8 1	1 1 1	1 8 6	1 5 7	5 5 0	3 16 6	31
3. 9 cwt. super. per acre	4 17 3	1 10 3	2 2 9	1 7 6	7 15 0	4 12 3	46
4. 6 cwt. super., 1 cwt. pot. sulph. ..	5 17 3	2 10 3	2 3 0	0 16 8	12 15 0	10 12 0	76
5. No manure	3 7 0	..	..	..	..	..	..
6. 6 cwt. super., 1 cwt. ammon. sulph. ..	4 13 3	1 6 3	2 1 3	1 10 7	6 15 0	4 13 9	40
7. 6 cwt. super., 1 cwt. each A.S. and P.S.	5 17 3	2 10 3	2 15 9	1 1 8	12 15 0	9 19 3	76
8. 6 cwt. market garden manure ..	5 12 2	2 5 2	2 11 0	1 2 6	11 7 6	8 16 6	67
9. 6 cwt. basic phos.	4 10 3	1 3 3	1 13 0	1 7 6	6 0 0	4 7 0	35
10. 7 cwt. monamonium phos.	5 12 2	2 5 2	11 11 0	5 2 6	11 7 6	0 3 6	67

Returns calculated at £5 per ton.

During the four years of experimental work at Warragul, the only alteration made in the manure has been that the rates of market garden manure on plot 8 and of basic phosphate on plot 9 were both increased from 3 cwt. per acre to 6 cwt. per acre for the season 1929-30. This alteration was made because it was estimated from previous findings that these higher rates could be applied with advantage to this class of soil. Table X. gives in detail the results of the past four years' work on these plots, and shows also the average returns in weights per acre and percentages. The alteration in weights of manures applied on plots 8 and 9 precludes, of course, their inclusion in the averages shown. These can be compared on the figures given.

TABLE X.—AVERAGE RESULTS, FOUR YEARS.

Season.	1 3 cwt. Super. per acre.	2 6 cwt. Super. per acre.	3 9 cwt. Super. per acre.	4 6 cwt. Super., 1 cwt. Pot. Sul. per acr	5 No Manure.	6 6 cwt. Super., 1 cwt. Sul. Amm. per acre.	7 6 cwt. Super., 1 cwt. Sul. Amm., 1 cwt. Sul. Pot. per acre.	8 3 cwt. Mkt. Gdn. Manure, three years; 6 cwt. Mkt. Gdn. Manure, one year, 1929–30. per acre.	9 3 cwt. Basic Phos., three years; 6 cwt. Basic Phos., one year, 1929–30, per acre.
	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.
1926–27	12 15 0	12 15 0	13 0 0	15 0 0	6 18 3	13 7 2	14 0 0	11 2 2	10 12 2
1927–28	7 10 0	9 18 0	10 3 2	10 14 1	3 1 2	10 3 2	10 14 1	7 10 0	7 10 0
1928–29	6 8 2	7 12 2	6 5 3	7 15 1	3 12 1	7 12 2	6 19 1	6 16 2	6 8 2
1929–30	3 14 0	4 8 1	4 17 3	5 17 3	3 7 0	4 13 3	5 17 3	5 12 2	4 10 3
Average 4 years ..	7 11 3	8 13 2	8 11 3	9 16 3	4 4 3	8 19 1	9 7 3	..	..
% Increase ..	78%	104%	102%	132%	..	111%	121%	..	..

From the above figures it will be seen that the manurial dressing giving easily the best return on this soil is that of 6 cwt. super, with 1 cwt. potash sulphate per acre.

CHILDERS

The Childers plots, which are situated on a loamy soil on the farm of Mr. J. F. Humphries, suffered severely from the dry spell during January and February, 1930, and did not recover well. This was particularly the case with regard to the no manure section which produced practically nothing. The consequence is that the differences between the no manure and other plots are very wide, and show very high percentage increases which, however, have been recorded.

In the following table are shown the details for the season:—

TABLE XI.—RESULTS OF MANURIAL TESTS ON POTATOES, CHILDERS, 1929-30.

Manures.	Market Tubers.	Increase from Manures.	Cost of Manure per acre.	Cost per ton Increase.	Increased Value per acre.	Net Increased Value per acre.	Percentage Increase.
	T. c. q.	T. c. q.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	%
1. 3 cwt. super. per acre	1 11 0	1 3 0	0 14 3	0 12 6	5 15 0	5 0 9	287
2. 6 cwt. super. per acre	1 18 3	1 10 3	1 8 6	0 18 4	7 13 9	6 5 3	387
3. 9 cwt. super. per acre	2 6 2	1 18 3	2 2 9	1 1 8	9 13 9	7 11 0	487
4. 6 cwt. super., 1 cwt. sulph. pot. ..	2 9 0	2 1 1	2 3 0	1 0 10	10 6 3	8 3 3	516
5. No manure	0 7 3	..	..	..	..	..	..
6. 6 cwt. super., 1 cwt. sulph. ammon. ..	3 7 1	2 19 2	2 1 3	0 14 2	14 17 6	12 16 3	737
7. 6 cwt. sulph., 1 cwt. each P.S. and A.S.	2 19 2	2 11 3	2 15 9	1 1 4	12 18 9	10 3 0	650
8. 6 cwt. market garden manure ..	2 11 3	2 8 1	2 11 0	1 1 2	12 1 3	9 9 3	600
9. 6 cwt. basic phos.	1 13 2	1 5 3	1 13 0	1 5 0	6 8 9	4 16 9	325

Returns calculated at £5 per ton.

These plots have been in operation for seven years, so that the average results during that period—embracing many seasonal variations—are valuable. During that period the consistently greatest returns have been gained from the "6 and 1" dressing—that is, 6 cwt. super. with 1 cwt. ammonium sulphate per acre.

Consideration of the figures given in Table XII. discloses the marked superiority of this form of manuring. Over a period of seven years the average increase from the "6 and 1" dressing has been no less than 183 per cent. as compared with no manure. The next best average return was from the complete manure (plot 7), which gave 165 per cent. increase. It should be noted, however, that in the case of plot 7, an extra cost of approximately 15s. per acre was involved for potash sulphate to produce a lesser return. Exactly why potash sulphate should reduce the yield in the majority of cases when applied to potatoes is not clear, but the fact remains that it does so. Sir John Russell, when in Australia a few years ago, stated at one of his lectures that at Rothamsted Experimental Station, England, it had been noted that in years having a large number of hours of sunshine during the growing period of a crop lighter yields were obtained from potassic manuring than when dull weather prevailed. Normally Victoria certainly has longer and more frequent periods of sunshine than usually experienced in England, but

TABLE XII.—RESULTS OF MANURIAL TRIALS AT CHILDERS, SEVEN YEARS.

Season.	1 3 cwt. Super. per acre.	2 6 cwt. Super. per acre.	3 9 cwt. Super. per acre.	4 6 cwt. Super., 1 cwt. Pot. Sul. per acre.	5 No Manure.	6 6 cwt. Super., 1 cwt. Sul. Amm. per acre.	7 6 cwt. Super., 1 cwt. Sul. Pot. 1 cwt. Sul. Amm., per acre.	8 3 cwt. Mkt. Gdn. Manure, six years; 6 cwt. Mkt. Gdn. Manure, one year, 1929-30. per acre.	9 3 cwt. Basic Phos., six years; 6 cwt. Basic Phos., one year, 1929-30, per acre.
	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.
1923-24	7 10 0	8 15 0	8 15 0	8 15 0	4 15 0	8 17 2	7 10 0	7 10 0	5 15 2
1924-25	3 12 2	4 0 0	3 15 0	3 15 0	1 10 0	4 0 0	4 0 0	3 17 2	3 2 0
1925-26	5 3 2	5 3 2	5 8 3	5 3 2	1 5 0	7 5 0	8 5 3	5 10 0	7 5 0
1926-27	5 15 0	6 10 0	6 6 1	6 10 2	3 9 2	8 8 3	6 16 1	5 16 1	5 15 2
1927-28	5 10 0	5 16 1	6 15 0	6 17 2	2 8 3	7 12 1	7 3 3	5 5 0	4 3 3
1928-29	4 3 2	4 12 3	5 0 0	4 3 2	2 1 3	5 5 0	5 2 0	4 8 1	4 1 1
1929-30	1 11 0	1 18 3	2 6 2	2 9 0	0 7 3	3 7 1	2 19 2	2 11 3	1 13 2
Average 7 years ..	4 15 0	5 5 1	5 9 2	5 7 2	2 5 1	6 7 3	5 19 3	..	..
% Increase ..	110%	133%	142%	137%	..	183%	165%	..	..

that is only at best a partial explanation. The fact remains that depression of yield usually follows potash applications to potatoes. Warragul country is a notable exception. It is interesting to note that during the past season, on experiments with French beans at Kalimna, Gippsland, potash at the light rate of ½ cwt. per acre showed a reduction of 40 per cent. of crop. A noticeable feature of these potato manure trials is that (excepting on the red volcanic belt in the central highlands and the Western District) 6 cwt. per acre appears to be the optimum dressing of superphosphate.

Table XII., on the previous page, shows the details of the seven years' results. As at Warragul, the weights of manures applied in plots 8 and 9 were altered last season from 3 cwt. to 6 cwt. per acre respectively, so that the averages for these are not given.

FISH CREEK.

Manurial trials at Fish Creek have been carried on for two years only, so that no definite conclusions can yet be drawn from the results. The soil—a grey clay loam—has been out in grass for a number of years, and the residual effect of this may be apparent for some time. There is, however, a distinct difference in the yields of the various rates of super. applications which show in favour of the 6 cwt. per acre dressing. Potash again shows to disadvantage, giving here an appreciable lowering of the yield when compared with super. alone, and also with super. in conjunction with ammonium sulphate.

Further experimental work is necessary at Fish Creek before anything definite can be said, though it can be observed that results obtained so far tend towards the corroboration of the findings of the longer-established stations.

TABLE XIII.—RESULTS OF MANURIAL TESTS ON POTATOES AT FISH CREEK, SEASON 1929-30.
(Conducted on the farm of Mr. R. Skinner. Soil—Grey clay loam.)

Manures.	Market Tubers.	Increase from Manures.	Cost of Manure per acre.	Cost per ton Increase.	Increased Value per acre.	Net Increased Value per acre.	Percentage Increase.
	T. c. q.	T. c. q.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	%
1. 3 cwt. super. per acre	6 9 2	2 1 1	0 14 3	0 6 8	10 6 3	9 12 0	46
2. 6 cwt. super. per acre	6 11 0	2 2 3	1 8 6	0 13 4	10 13 9	9 5 3	48
3. 9 cwt. super. per acre	6 2 1	1 14 0	2 2 9	1 5 0	8 10 0	5 7 3	38
4. 6 cwt. super., 1 cwt. pot. sulph. ..	6 3 3	1 15 2	2 3 0	1 4 6	8 17 6	6 14 6	40
5. No manure	4 8 1	..	..	..	..	..	..
6. 6 cwt. super., 1 cwt. ammon. sulph. ..	7 3 0	2 14 3	2 1 3	0 15 0	13 13 9	11 12 6	62
7. 6 cwt. super., 1 cwt. each P.S. and A.S.	7 1 2	2 13 1	2 15 9	1 0 10	13 6 3	10 10 6	60
8. 6 cwt. market garden manure ..	7 7 1	2 19 0	2 11 0	0 17 2	14 15 0	12 4 0	67
9. 6 cwt. basic phos.	7 0 0	2 11 3	1 13 0	0 12 8	12 18 9	11 5 9	58
10. 7 cwt. monamonium phos.	6 18 2	2 10 1	11 11 0	5 0 0	12 11 3	1 0 3	56

Values calculated at £5 per ton.

TABLE XIV.—RESULTS OF MANURIAL TRIALS AT FISH CREEK, TWO YEARS.

Season.	1 3 cwt. Super. per acre.	2 6 cwt. Super. per acre.	3 9 cwt. Super. per acre.	4 6 cwt. Super., 1 cwt. Sul. Pot. per acre.	5 No Manure.	6 6 cwt. Super., 1 cwt. Amm. Sul. per acre.	7 6 cwt. Super., 1 cwt. Pot. Sul., 1 cwt. Amm. Sul. per acre.	8 6 cwt. Mkt. Gdn. Manure per acre.	9 6 cwt. Basic Phos. per acre.
	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.
1928–29	10 6 1	11 7 2	9 0 0	10 3 2	6 13 3	10 17 3	10 3 2	*	*
1929–30	6 9 2	6 11 0	6 2 1	6 3 3	4 8 1	7 3 0	7 1 2	7 7 1	7 0 0
Average 2 years ..	8 7 3	8 19 1	7 11 0	8 3 2	5 11 0	9 0 1	8 12 2	..	..
% Increase ..	51%	61%	36%	47%	..	62%	55%	..	..

* One year only.

Orchard and Garden Notes

By Edward E. Pescott, F.L.S.

The Orchard.

THE importance of disease prevention cannot be over-emphasized and it is well known that certain diseases can be kept away only by preventive measures. Two fungus diseases have been very prevalent this season as a result of the cool, moist summer; they are "prune rust" and "brown rot." The former attacks leaves of the plum family, causing them to drop prematurely, and appears on the back of the leaves as small dark-brown rust pustules. The latter disease attacks peaches, apricots, cherries, and plums in particular, causing a rapid softening and decay of the fruit just as it is ripening. Usually the fruit shrivels and hangs on the trees as "mummies."

For plum or prune rust, the trees should be sprayed with Bordeaux mixture in winter. But it is equally important that, if possible at the present time, all fallen diseased leaves should be collected and burned. For brown rot, the mummy fruit with the attacked twigs should be gathered and burned, since these carry infection over to the next season. The trees should then be sprayed with lime sulphur. Give the first spraying just before the buds begin to swell, and the second when the buds show a pink colour.

Strawberry plants may now be set out, using strong crowns or first or second runners only for planting. Strawberries prefer a heavy soil, one composed either of clay, or of old red basaltic loam. The plants are set out in rows, or in the matted-bed system according to preference. Strawberries are lime-loving plants, and an autumn dressing of lime on established plantations is always desirable.

The Flower Garden.

At this time, the garden should be full of flowers—dahlias, gladioli, roses, petunias, and many others will be in abundance everywhere.

The petunia is one of the hardy plants which thrive, flowering for months and even years. Some of the more hardy types have been known to flower continuously for several years. While they are usually treated as annuals, petunias may be grown also as perennials. The seed should be sown in boxes or pans, in a light sandy soil; and when the plants are carrying a few leaves, they may be planted out in the garden. Special varieties are quite readily raised from cuttings. Both seed and cuttings may be started now.

Petunias.

The ordinary types often are grown in massed single colours, and for this purpose Royal or Ormond Purple and Rosy Morn (pink) are used. Seedlings usually come true to colour. Giant of California is the name given to the large-flowered strain, the double form of which often has strongly frilled petals. For the best results, petunias should be raised in autumn, and planted out as quickly as possible. They will then flower in early spring, and thence continuously for a long period. They like a good loamy soil, and an open, warm sunny position.

The present is probably the best period of the year for planting out shrubs, palms, and

other permanent plants for the garden. The soil is warm, and there is ample water, so that the plants quickly take root, and become well established before winter. The soil should be well dug over, incorporating with it a small supply of bone dust. Deep holes should be avoided, the plants being placed in the worked soil, at the same level in which they were growing in the pots.

Carnations should be planted out now, using young rooted cuttings, layers, or seedlings. It is not yet too late to sow the seed, sowing it in a light sandy soil. At this time of the year all carnations should be given a good sprinkling of lime.

The Vegetable Garden.

Attention should be paid to drainage in this section; and all beds of growing vegetables should be raised by adding more soil, the paths also being lowered wherever possible. Ridging the rows of plants is a wise plan. Weeds are growing abundantly now, and these should be worked out before they grow to any size, hand-weeding between the rows. Weeds should be pulled out when quite small, if growing in among seedlings such as onions, carrots, and parsnips.

Cabbage, onion, sprouts, and cauliflower plants may be set out.

This is the time when all garden beds should be manured, using animal manure for preference. The manure should be dug in and well covered over. For general dressings other than animal manure bone manure should be used. Among growing plants, sulphate of ammonia may be sprinkled, care being taken to keep it away from the foliage and the stems. This is a good autumn fertilizer, which induces quick and abundant rooting in the garden.

Asparagus beds should be cleared out as soon as frost browns the shoots; a few inches of the top soil may be removed, replacing it with a dressing of animal manure. Rhubarb also should be well manured.

Australian Publicity Abroad. A Retail Fruiterer's Display at Ilford, England.

Professional Papers

[This section is devoted to professional papers and articles of a scientific character.]

Experiments on the Control of "Stinking" Smut or Bunt

By R. L. Twentyman, B.Ag.Sc., Department of Agriculture.

(Although much of the information contained in this report has been made available to farmers from time to time by means of the "Better Farming Train" and the Experiment Station reports, this is the first time that a complete account of the whole experiment has been prepared. It has not been found possible in this report to give a full account of the detailed figures from each experiment, and the figures have been confined to a summary of the yearly results.

This first article deals with the results of the comparison of the wet and dry pickles. The results obtained in the tests relating to the various copper powders will appear in a subsequent article.)

ALTHOUGH the disease, Bunt or Stinking Smut (Tilletia tritici and T. laevis), is of widespread occurrence throughout Victoria, the measures adopted for its control are so effective that losses due to infection by this disease are now very small. Almost invariably seed wheat is treated for bunt before sowing, probably the only exceptions being a few farms in the Mallee and Goulburn Valley, where seeding is done early, whilst the soil is still warm and dry. Sown in this manner the crop usually escapes infection, but there is always a risk of a badly infected crop.

Until recent years the seed disinfection was accomplished by steeping the grain in solutions of either bluestone (copper sulphate) or formalin. When properly carried out both of these treatments had given very satisfactory control of the bunt, but frequently their action on the seed wheat itself has been rather severe. This injurious effect manifests itself in both a lowering of the germination of the seed, and a decrease in the vigour of the seedlings.

For many years wheat-growers have been aware of the injurious effects of the wet pickle on the seed, and the vigour and growth of unpickled as compared with the wet pickled seed have occasioned much comment. Realizing the injury caused to the seed and the general inconvenience of the wet treatments, farmers were quick to appreciate the advantages offered by the new dry method of pickling with copper powders, and this method is now extensively used throughout the State.

Soon after the introduction of the new method of dry pickling, this Department commenced, at Werribee, Rutherglen, Burnley, and Longerenong, an extensive series of pickling

tests to obtain definite evidence regarding the merits of this treatment. These tests were designed to furnish information on the following matters under field conditions:—

(1) To compare the wet and dry treatments with regard to—

(*a*) Rate and percentage of germination of seed;
(*b*) efficiency as a bunt control;
(*c*) ability to prevent reinfection of treated seed; and
(*d*) effect of the treatment on the grain yield of the crop.

(2) To supply the following information regarding the dry pickle:—

(*a*) The amount of powder necessary to apply for smut control;
(*b*) The comparative efficiency of various commercial copper powders; and
(*c*) The effect of dilution of copper powders.

As first laid out, in 1925, the experiment consisted mainly of a large number of hand-sown rows of variously pickled seed. The rows were 1 chain long and 14 inches apart, 200 seeds being evenly spaced in each row. The experiment included 625 such rows at both Werribee and Rutherglen, and 245 at Burnley. Counts for the percentage of germination were made upon these rows six weeks after sowing, and the plants were examined at maturity to determine the amount of smut present in each row.

From the experiences of overseas workers it was expected that some difficulty would be found in obtaining a satisfactory degree of infection, and accordingly a range of spore dosages, varying from 1-250 to 1-2000, was adopted. Also the commercial dry powders were applied at the varying rates of $\frac{1}{4}$, $\frac{1}{2}$, 1, $1\frac{1}{2}$, 2, $2\frac{1}{2}$ and 3 oz. per bushel, and diluted powders containing 100 per cent., 80 per cent., 60 per cent., 40 per cent., 20 per cent., and no copper carbonate were also tested.

Satisfactory results were obtained from the germination and yield trial sections, but owing to the low percentage of smut appearing at harvest time, no definite conclusions were reached for the infection part of the experiment.

In 1926 similar experiments were repeated at Rutherglen and Werribee, but in view of the previous year's experience the spore dosages were confined to the heavier rates, and more attention was given to the lighter dressings of powder. Again, the germination counts gave

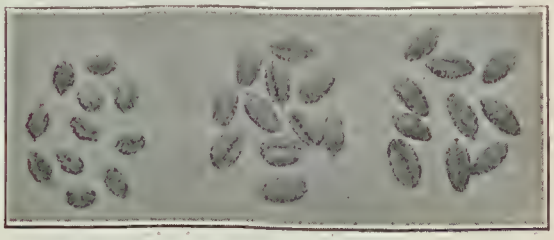
Healthy. Bunted. Bunted.

One Healthy and Two Bunted Heads of Wheat.

[From Journal of the British Ministry of Agriculture.

satisfactory results, but although a small amount of smut did appear in the rows at harvest, experimental errors masked the differences between the various powders.

After the second year's failure to obtain a satisfactory smut infection, it was seen that, before any real progress could be made towards determining the relative merits of the commercial powders, it was necessary to evolve means of ensuring a reasonably heavy smut infection. Accordingly, in 1927, the plan of the experiment was altered, and efforts were concentrated on determining what were the factors responsible for the light and erratic smut infection. Even with heavily smutted seed at Werribee and Rutherglen, a half ounce of powder per bushel was able to reduce the smut infection to a quantity too small to give reliable figures. Soil temperatures at seeding time at both Werribee and Rutherglen were sufficiently low to have encouraged a good smut infection. There



Bunt Balls on the left; Clean Grains in the centre; and Grain contaminated with adhering spores of the Bunt Fungus on the right.

[From Journal of the British Ministry of Agriculture.

were no figures available giving the daily soil temperature at the depth of sowing at either of these stations, but the following table shows the mean and the maximum and minimum daily temperatures taken at a depth of 6 inches, for weekly periods over a number of years:—

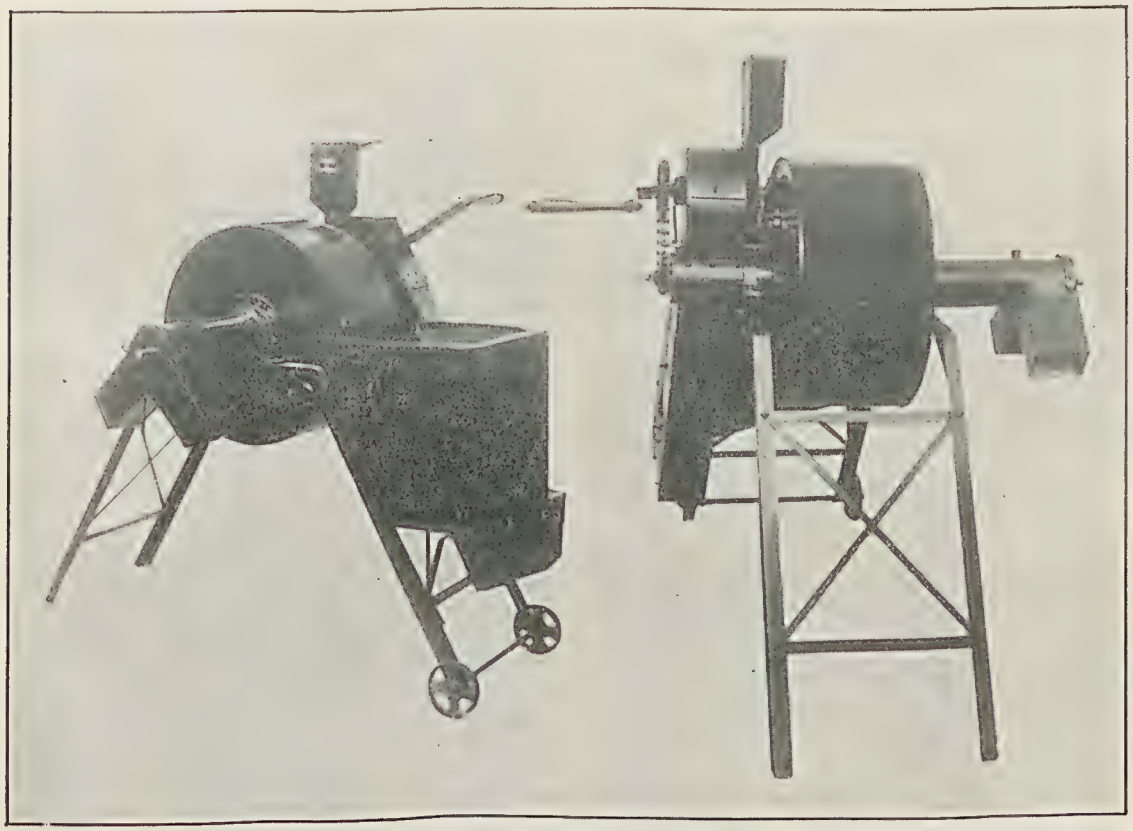
TABLE I.—MEAN OF MAXIMUM AND MINIMUM DAILY SOIL TEMP., DEPTH 6 INCHES.

Period.	Werribee.	Rutherglen.
	° C.	° C.
May 1–8	13·2	11·3
8–15	12·0	10·6
15–22	11·5	9·6
22–29	10·6	9·4
29–June 5	9·8	8·5
June 5–12	9·1	8·9
12–19	8·5	6·2
19–26	9·1	7·4
26–July 3	8·6	6·3

Sowing at Rutherglen was done usually during the first week in June, and in mid June at Werribee. The above temperatures should have been favorable for smut infection, so other causes must have been responsible for the low infection.

Throughout the experiment it has always been the aim to imitate, as far as possible, the ordinary natural methods of infection. For this reason it was desired to keep the rate of smut dosage as light as possible, and to attempt to sow the wheat under soil and weather conditions favorable to the smut.

Examination of the results of the hand rows showed a great variation in the degree of infection. Adjacent rows, sown with similar seed, varied greatly in the amount of infection, and the individual variations from row to row often greatly exceeded those variations due to local soil differences. Consequently it was considered that the check rows would not give any useful comparison with their adjacent treated rows,



Side and End View of Dry Pickling Machine.

and it was decided to conduct tests to determine the possible causes of these variations. Tests made at Rutherglen and Werribee with soil of varying degrees of fineness, showed that seed sown in fine soil was generally more heavily infected than where the soil texture was coarse. The differences, however, were not very marked, and in view of the small variation in tilth from row to row, it was not considered likely that much variation in hand rows was due to this cause. Sowings made with and without dressings of superphosphate failed to show any definite influence on the rate of infection.

On the other hand, tests made on the depth of sowing of the seed showed it to have a big influence on the infection. In the 1927 tests at Longerenong, it was found that deeply sown seed was much more heavily infected than was that sown shallowly, but in further tests in 1928, the reverse was found, and the shallow sown seed was more heavily infected. In these experiments the shallow sown seed was sown at from ¾ to 1 inch deep, and the deeply sown at from 2½ to 3 inches.

TABLE II.—DEPTH OF SOWING TESTS, LONGERENONG.

Treatment.	Percentage Infection.	
	1927.	1928.
	%	%
Shallow sown, ¾"	15·1	36·6
Deep sown, 2½–3"	34·7	16·5

Tests with 90 hand-sown rows at Rutherglen and Werribee during 1927 only, gave results rather similar to those at Longerenong in that year, but no further tests were made in 1928—

TABLE III.—SHOWING PERCENTAGE OF SMUTTED PLANTS.

Station.	Treatment.	Spore Dosage, 1–1000.	Spore Dosage, 1–250.	Spore Dosage, 1–100.
		%	%	%
Werribee ..	Shallow sown ..	10·9	36·5	41·6
,, ..	Deep sown ..	21·5	51·8	58·5
Rutherglen ..	Shallow sown ..	23·2	55·5	76·5
,, ..	Deep sown ..	37·1	64·1	90·7

From these results it would appear that it is not the actual depth of sowing that determines the degree of infection, but rather that it is due to other factors, such as temperature and moisture, which are altered by the varying depths of sowing. Although every effort was made to keep the hand rows uniform in construction, it is thought probable that differences in the depth of planting were largely responsible for the variations in infection in them.

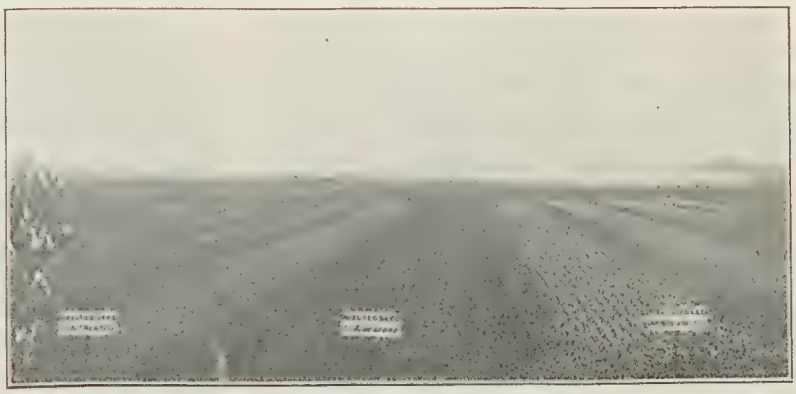
As a consequence, it was decided that the use of hand rows for most of the testing work should be abandoned, and small drill-sown plots substituted. Initial trials with some of these plots in 1927 gave promising results, and in 1928 practically the whole of the testing was done by this means. These plots usually were about three-quarters of a chain long and five or six drill hoes wide, with a 21-inch path between each plot. Each alternate plot was used as a check, consequently a treated plot always had a check on either side of it.

As it was quite impracticable to harvest these plots by counts of individual plants, the estimation of the smut was made by means of a count of heads. For this purpose sample bundles were taken from each plot, the sample being taken on a systematic stagger so as to be thoroughly representative of the whole plot.

The size of the sample necessary to ensure accurate results depended largely on the percentage of infected heads present. With a 50 per cent. infection a bundle of 500 heads, composed of scattered samples taken throughout the plot, gave satisfactory results, but with a lower infection it was found necessary to take a much larger sample. With a reduction to 6 or 7 per cent. smut, from 1,500 to 2,000 heads per plot were taken. With a further reduction in the percentage of smut, the size of the sample becomes excessively large, and with less than 1 per cent. smut, this method of estimation is not suitable. With these plots containing only a very small quantity of smut, more accurate results can be obtained by making a direct count of the total number of smutted plants appearing in the plots. For this purpose it is essential that the infected heads shall be easily distinguished in the field, and that the total number of plants per plot shall be approximately equal. Fortunately, at Longerenong, both of these requirements were satisfactorily met. Using the Dollar variety of seed the smutted heads were fairly easily distinguished, and the growth in the plots was always very uniform. At this station an excellent

uniform germination was always obtained with the dry pickled seed plots, and the total numbers of plants per plot have been found to be very constant.

The following table gives the total number of plants counted in adjacent plots at Longerenong during the year 1930, and shows that no material errors are likely to be introduced into the results by assuming that the total number of plants per plot is equal:—



Pickling Tests at Werribee showing more rapid germination of the Dry Pickled Wheat (right).

TABLE IV.—SHOWING COUNTS OF TOTAL PLANTS IN FIVE ADJACENT PAIRS OF PLOTS.

Plot.	Total Number of Plants per ¼-chain Plot.
A 7	1,358
A 8	1,352
D 3	1,258
D 4	1,364
D 11	1,270
D 12	1,298
H 5	1,294
H 6	1,360
H 13	1,302
H 14	1,292

By the use of this type of plot very satisfactory results can be obtained even with fairly low percentages of smut, as each plot includes a sufficiently large number of plants to ensure reasonably uniform results. A large number of plots can be conveniently examined at harvest time, and on account of this, sufficient replication of the plots can be made to ensure accuracy.

Germination Tests.

Soon after the introduction of the dry pickling method, it was noticed, from the appearance of the treated crops, that both the vigour and percentage of germination of the seed were much better than where the seed had been wet pickled. In order to obtain a measure of the improvement effected by the dry pickling, germination tests were carried out with wet and dry pickled seed. For this purpose counts were made of the germination of treated seed sown in hand rows under field conditions. The rows were either 14 inches or 21 inches apart, and 200 seeds, spaced at 4 inches, were sown in each row. The wet pickling was done not more than 24 hours prior to sowing, and the counts were made upon the completion of the germination. The figures were taken from 625 rows at Werribee and Rutherglen in 1925, and 442 rows at each station in 1926—

TABLE V.—SHOWING PERCENTAGE GERMINATION OF PICKLED SEED, WERRIBEE AND RUTHERGLEN, 1925-6.

Treatment.	Werribee.		Rutherglen.	
	1925.	1926.	1925.	1926.
	%	%	%	%
Unpickled	71	67	90	73
Formalin, 1–450, 3 mins.	67	63·3	87	67
Bluestone, 1¼ %, 3 mins. ..	54·5	53·7	83	53
Dry pickle, 2 oz. per bush..	73	68·8	90	76

In the following year no hand-sown rows were available for counting, and it was necessary to make counts upon plots of drill-sown seed. These counts, which were made at Werribee and Longerenong during 1928, gave results similar to those outlined above.

TABLE VI.—COUNTS OF GERMINATION IN EIGHTEEN FIELD PLOTS, WERRIBEE AND LONGERENONG, 1928.

Treatment.	Werribee Count of Germination.	Longerenong Count of Germination.
	%	%
Formalin 1–450	68·3	74·1
Bluestone, 1¼ %	55·4	81·8
Dry pickle, 2 oz. per bush. ..	77·0	90·2

In all the tests with the wet pickles, the strengths of solutions were the same as used in ordinary farming practice, formalin being used at the rate of 1 lb. of commercial formalin (approximately 38 per cent. formaldehyde) to 45 gallons of water and bluestone or copper sulphate as a 1¼ per cent. solution. In both cases the seed was immersed for three minutes and then allowed to drain. The dry pickle was a high grade powder (basic copper carbonate) used at the rate of 2 oz. per bushel.

These results show that, in all cases, dry pickling was followed by a much better germination than was treatment with the wet pickles. Not only was the percentage of germination better with the dry treatment, but the increased vigour and growth of the young seedlings also were very marked. It will be noticed in the above results that the dry-pickled wheat always germinated as well as and generally a little better than the unpickled seed. Similar results have been observed throughout all the germination tests. Possibly, this is due to the presence of the copper powder enabling some of the grains to escape injury from soil organisms which would otherwise attack and destroy them. The seed used in these tests was a plump, well-graded sample, and it is probable that, for an inferior sample of grain, the differences would be even more marked. Also, these counts were obtained under favorable germination conditions, but it is under adverse germination conditions that the advantage of this method of dry pickling are most pronounced. An excellent example of this was obtained at Longerenong, in 1927, when a section of 104 germination test rows experienced very bad germination conditions. The following table shows the percentage of plants that became established in these rows:—

TABLE VII. — GERMINATION PERCENTAGE UNDER ADVERSE CONDITIONS, LONGERENONG, 1927.

Treatment.	Percentage Germination.
	%
Smutted unpickled	38·7
Bluestone, 1¼ %	27·6
Formalin, 1–450	15·2
Dry pickle, 2 oz. per bush.	42·1

During 1925, tests were conducted at Burnley to determine the relative rates of germination of wet and dry pickled seed. In these trials, seed treated with copper sulphate always germinated badly, being very much poorer, both in percentage and rate of germination, than untreated seed. Dry pickled seed was usually about a day later in coming through than unpickled seed. Although formalin treated seed did not give quite as high a germination percentage as did the dry pickled, germination took place just as quickly.

It is a well established fact that, under certain conditions, the germination of formalin-treated seed is liable to be most unsatisfactory. This condition manifested itself on several occasions during the experiments, and an attempt was made to determine the factors causing this condition. Annie M. Hurd (in the *U.S.A. Jour. Agric. Res.*, vol. xx., No. 3, Nov. 1, 1920) gives an account of the conditions under which formalin-treated seed suffers injury. This work showed that it is the condition of storage of the grain after treatment that determines the injury to the seed, rather than the actual steeping operation itself. Working on these lines it was found that, according to the amount of drying of the stored seed, the germination of the grain could be very greatly reduced, and the growth of plants was similar to that occasionally observed with formalin under field conditions. It appeared, however, that the condition of the soil at seeding could act as a complementary factor, and served to lessen or increase the degree of injury to the germination even under circumstances which did not give a delayed germination.

Yield Trials.

In order to determine if the effect of the improved germination of the dry pickled wheat persisted throughout the growth of the crop, and resulted in an increased yield, trials with field plots were conducted at Rutherglen, Werribee, and Longerenong. Replicated plots of each treatment, approximately one-sixteenth of an acre, were sown each year. The plots were sown with the usual local rates of seed and manure, and harvested with stripper and winnower, after the samples for smut estimation had been taken. Federation seed smutted 1-750 was used from 1925 to 1929, but in 1930 no smut was available for inoculation purposes, and unsmutted seed was used.

The improvement in yield obtained by the use of the dry pickle was most marked under adverse seeding conditions. With first-class germination conditions the wet pickled seed made satisfactory growth, and the yield obtained was but slightly lower than that of the dry pickled seed. With unfavorable germination conditions, the dry pickled wheat suffered much less than did the wet pickled seed, and usually resulted in a considerably improved yield. From Table VIII. it will be observed that there was usually a small increase in yield in favour of dry pickling, but in some cases the increase was quite large. It might be contended that with a heavier seeding, the wet pickled wheat would produce as good a crop as the dry pickled, but earlier tests conducted with yield trial plots did not support this theory. It would appear that the improved crop is a result, not so much of a higher rate of germination, but of the increased vigour of the germinating seedlings, as compared with those resulting from wet pickling.

Comparison of Efficiency of Wet and Dry Pickles.

Seed sown in the above yield trial plots usually was inoculated with powdered smut, at the rate of 1 part to 750 of seed, before treatment. Sample bundles of heads were taken from these plots at harvest time, and counts were made to determine the percentage of infected heads present in the plots.

Under the conditions of the experiment, bluestone 1¼ per cent., and dry pickle 2 oz. per bushel, proved about equally effective in the control of smut, but somewhat better control was obtained from the formalin 1-450 treatment, when used under these conditions.

In a test, such as the above, to determine the relative efficiency of the pickling methods it was necessary to use only powdered smut, and no unbroken smut balls were present in the grain. Consequently, the problem of reinfection does not enter into the experiment. It is quite impossible to determine to what extent reinfection does occur in actual practice, but instances of the apparent failure of formalin to control smut have been traced directly to this source.

Reinfection Tests.

In order to compare the powers of the various pickles to control reinfection, pickled seed, as used in the above yield trials, was reinfected with smut spores before sowing. The results are shown in the following table. The plots were sown with Federation wheat, as used in yield trial plots. Reinfection was at the rate of 1 in 750, and estimates were made by a count of heads, and expressed as percentage smutted.

TABLE VIII.—RESULTS OBTAINED FROM YIELD TRIALS.

Station.	Treatment.	1925.	1926.	1927.	1928.	1929.	1930.	Average, 1925–30.
		Bush. per ac.	Bush. per ac.	Bush. per ac.	Bush. per ac.	Bush. per ac.	Bush. per ac.	Bush. per ac.
Rutherglen ..	Smutted unpickled	26·7	Plots	21·6	..	..	..	..
,, ..	,, formalin, 1–450, 3 mins. ..	25·8	not	25·7	13·3	30·3	11·3	21·4
,, ..	,, bluestone, 1¼ %, 3 mins. ..	17·4	har-	26·2	16·0	30·1	12·6	20·4
,, ..	,, dry pickle, 2 oz. per bush...	27·1	vested.	29·4	18·2	32·7	15·3	24·6
Werribee ..	Smutted unpickled	10·0	12·4	5·0	..	..	..	..
,, ..	,, formalin, 1–450 ..	10·9	14·3	6·9	4·1	16·9	9·2	10·4
,, ..	,, bluestone, 1¼ %	9·8	14·1	7·1	4·1	15·9	10·5	10·3
,, ..	,, dry pickle, 2 oz. per bush...	11·6	15·2	6·7	4·6	16·0	13·9	11·3
Longerenong ..	Smutted unpickled	31·9	37·7	..	..	..	..	..
,, ..	,, formalin, 1–450 ..	41·6	41·9	19·6	30·9	18·3	25·3	29·8
,, ..	,, bluestone, 1¼ % ..	37·4	40·3	19·8	29·3	18·0	26·7	28·7
,, ..	,, dry pickle. 2 oz. per bush...	43·6	43·3	19·9	31·5	19·5	29·9	31·3

Table IX.—Results of Reinfection Tests.

Treatment.	Longerenong.			Rutherglen.			Werribee.		
	1926.	1927.	1928.	1926.	1927.	1928.	1926.	1927.	1928.
		% Smut.	% Smut.						
Unpickled reinfected ..	No test	54·3	..	4·1	77·6	..	38·5	24·4	..
Formalin 1–450 reinfected ..		40·8	52·1	9·1	61·4	15·0	11·8	22·0	30·7
Bluestone, 1¼ % reinfected ..		2·2	5·3	0	8·3	·9	0	2·7	2·9
Dry pickle, 2 oz. reinfected ..		8·1	8·4	·2	19·0	2·1	1·3	1·3	3·9

Even under these severe conditions, both bluestone and dry pickle have given fairly good control, and both should be quite satisfactory under normal conditions. The dry pickle does not seem to be as effective as the bluestone in preventing reinfection. It is evident that formalin fails to prevent reinfection.

Conclusions.

A comparison of the wet and dry pickles discloses that the dry pickled seed germinates and grows much more vigorously than does wet pickled seed. The yield of wheat from the dry pickled seed shows a material increase over the wet pickled seed, especially when the germination conditions are severe.

The dry treatment can be carried out at any time previous to sowing, and seed so treated will retain its germination powers as well as unpickled grain. The treated wheat will be immune to attacks of weevils, and mice generally will avoid it.

Although under the conditions of these experiments, the dry pickle has not proved quite as effective in eliminating the smut as have the wet pickles, it has been found, in actual practice, that most farmers are obtaining better control with the dry method than they achieved with the wet pickle. The appearance of the dry pickled seed at the time of sowing readily shows whether the grain has been properly treated or not, but the appearance of the wet pickled seed gives no indication of the thoroughness of the treatment. Although the preparation of the solution for wet pickling is quite a simple matter, there are plenty of opportunities for mistakes to occur and pass unnoticed. The dry pickle provides the seed with a satisfactory degree of resistance to reinfection.

When first introduced the effect of the dust on the operator during the treatment was considered to be a serious disadvantage to the method; but now, with improved dusting machines and by avoiding the use of excessive quantities of powder, complaints as to the dust are seldom heard.

The actual cost of the pickling material is higher with the dry than with wet treatment, but this extra cost is compensated for by the lower labour charges and the general convenience of the treatment.

The main problem of interest now is not so much a comparison of the wet and dry treatments, but, rather, a consideration of the details connected with the dry treatment itself. An article dealing with this aspect of the question will appear in the next issue of this journal.

Summary.

(1) Dry pickling offers a more convenient method of smut control than does the old wet treatment.

(2) Treatment can be done at any time prior to sowing.

(3) Dry pickled seed germinates as vigorously as unpickled grain.

(4) Although for heavily smutted seed dry pickling is not so effective as wet treatment, under ordinary farming conditions the control is quite satisfactory.

(5) The dry treatment provides the grain with a satisfactory protection against reinfection.

(6) The yield of grain from dry pickled seed usually is appreciably better than from wet pickled seed.

Rose Diseases and Their Control

(Continued from page 149, Vol. XXVIII.)

By B. J. Grieve, M.Sc. (National Rose Society's Research Scholar; Fred Knight and Wyselaskie Scholar).

VII.—BROWN CANKER OF ROSES.

BROWN Canker is considered to be the most destructive disease of roses in the United States of America, though another disease known as Brand Canker may, under certain conditions, rival it in destructiveness.

During the early spring months the fungus causing the disease becomes particularly active on the canes, and, on the more susceptible varieties much damage may be done in a comparatively short time. The canes frequently are disfigured, and moreover both leaves and flowers are marred by the disease.

Fig. 10.—Brown Canker of Roses [*Diaporthe umbrina* (Jenkins).] Initial infection lesions on canes less than a year old (A–C.) and on a three-year old cane (D). (After Jenkins)

Jenkins[2] states that Teas, Hybrid Teas, and Hybrid Perpetuals, in the order named, are particularly susceptible, while the Briars, Rugosas, Mosses, and most of the species and ramblers are comparatively immune. Later observations indicate, however, that all types of roses are susceptible to a greater or less degree.

History and Distribution.

The fungus causing Brown Canker was described by Jenkins[1] in 1918.

There is reason for believing that the disease was present in the United States of America as far back as 1902, though it was not then economically serious. So far as is known at present Brown Canker is not prevalent in countries outside the United States of America.

Symptoms.

Cankers develop in late winter and early spring, arising from initial infection lesions, or from wounds. The initial infection lesions, which are at first purple and then white, are familiar to many as apparent blemishes more or less common to rose canes, but not as indications of a disease. They are nevertheless of prime importance as regards the control of the disease.

During winter and spring conspicuous bright cinnamon, buff-coloured cankers develop about the white spots on the one-year canes, often girdling them, and sometimes forming cankers several inches in length. The cankers may increase rapidly by additional purple marginal extensions until the stem is girdled. Occasionally the part of the stem which has been girdled becomes water-soaked in appearance, instead of forming definite cankers. The cankered surface is dotted with fruiting bodies—the pycnidial and ascosporic stages of the fungus. In mature specimens the small protruding beaks of the perithecia may be seen. The margin of a canker is generally

defined only by the difference in colour between the normal and cankered portions, and to this contrast in colour the conspicuous disfiguring effect of the disease is due.

The cankers differ from those of Common Canker of the Rose (*Coniothyrium Fuckelii*) in colour and appearance. The latter are of a dirty umber colour, and the lesions are depressed with raised margins.

The spotting on the foliage consists of small purple spots, and larger dead areas are cinnamon buff in colour bordered with purple.

Fruiting bodies of the fungus occur on the upper and under surfaces of the leaves. Only the outer exposed petals of the flowers are commonly affected. On these, large nearly circular areas are formed of a cinnamon buff colour. Pycnidial fruiting bodies are arranged in a definitely zonate manner.

Etiology of the Disease.

Brown Canker is caused by the fungus *Diaporthe umbrina*.—Jenkins.

Morphology.

The pycnidia are sub-globose to lens shaped, walls thin, but thickened at the apex, embedded, rupturing the epidermis irregularly ostiolate, simple or chambered 200–300 in μ. diameter. Pycnospores, subfusoid, straight or slightly curved, hyaline, 4.8–11.2 x 2 — 3.2 μ

Sporophores simple or branched.

Perithecia membranaceous, 2 to 5 immersed in a valsoid stroma around a pycnidium, globose with beak scarcely projecting above the epidermis, 100–290 μ in diameter, beaks 150–195 μ long. Asci clavate, sub-sessile, aparaphysate, 30–50 x 6.4 — 8 μ.

Ascospores elliptical, hyaline, more olivaceous when mature, 8–11.2 x 3.2. — 4 μ.

Life History.

Initial infection may take place on uninjured new growth. The mycelium of the fungus usually remains quiescent until late winter or spring. It then resumes its activity and cankers develop. The pycnidial stage of the fungus develops in great abundance in a few days' time in nature.

The perithecia occur less generally, and appear somewhat later. Both spore types allow the fungus to overwinter.

Fig. 11.—Brown Canker of Roses [*Diaporthe umbrina* (Jenkins)]. A blossom of Gloire Lyonnaise (C), two petals Countess of Gosford (B) and Oakmont (A). (After Jenkins.)

Control.

Control measures may be grouped as follows:—

(1) Exclusion.—Rose gardens should be carefully inspected to determine whether the disease is present, and precautions taken to prevent the entry of the disease into healthy gardens. Nursery stock for planting should be examined and all cankered plants destroyed.

If possible plants should be introduced from gardens known to be free of the disease.

(2) Protection. — Spraying with Bordeaux mixture prevents blossom infection, but no definite results are to hand on the effect of spraying in general, though the outlook is promising.

(3) Eradication.—There appears to be no value in cutting back and burning infected stems, as the disease appears as rampantly as before.

Brown Canker Bibliography.

1. Jenkins, A. E.—Brown Canker of Roses.—Jr. Ag. Res. 15, pp. 593-600, 1918.
2. Jenkins, A. E.—Brown Canker of Roses.—Amer. Rose Annual, pp. 161-183, 1927.

VIII.—BRAND CANKER OF ROSES.

Brand Canker is regarded as one of the more serious rose diseases in the United States of America, and on the Continent of Europe. It affects nearly all classes of roses, and has a very disfiguring effect on the plant, which is often killed outright.

Fig. 12.—Brand Canker of Roses (*Coniothyrium Wernsdorffiae* Laubert). (After Jenkins)

History and Distribution.

Brand Canker of roses was originally described in 1905 by Laubert[7] in Germany. After making a detailed morphological study of the causal organism, he concluded that it was a species of *Coniothyrium*, but he believed that it differed markedly from *Coniothyrium Fuckelii* Sacc., which causes Common Canker of roses. Laubert[7] therefore created a new species, namely, *Coniothyrium Wernsdorffiae* Laub.

Köck[6] in Austria described in the same year a disease on Tea roses which he ascribed to *Coniothyrium Fuckelii* Sacc. He believed that the disease on which he was working was identical with that of Laubert, and considered that Laubert was unjustified in creating a new species.

Laubert[8] in a later publication (1907), compared the two organisms *Coniothyrium Fuckelii* and *Coniothyrium Wernsdorffiae* Laub., and repeated his previous statements showing that in morphology the two fungi were quite distinct. He also went on to say that *Coniothyrium Fuckelii* Sacc., was merely a harmless saprophyte, but this statement is, of course, incorrect.

Güssow[2], two years later (1909), described a disease of roses in Ireland, the causative agent being considered by him to be *Coniothyrium Fuckelii* Sacc. He believed that the disease which he had studied was identical with that described by Laubert.

Waterman[12], working in the United States of America, has recently made a detailed study of the species of *Coniothyrium* attacking the rose. She reviews the work of the earlier investigators, and considers that Laubert[7] and Köck[6] were describing the same disease, namely, Brand Canker, while Güssow[2] was dealing really with Common Canker of roses. Waterman agrees with Laubert that Brand Canker of roses is a distinct type of disease, being caused by *Coniothyrium Wernsdorffiae* Laub., an organism quite distinct from *Coniothyrium Fuckelii* Sacc.

Brand Canker was recorded for North America (Canada) in 1924 by Howitt[3], and for the United States of America by Martin[9]. Jenkins and Martin[5] reported it again for the United States of America in 1926, and it was later described there by Jenkins[4], Westcott[13], and Waterman[11]. Brand Canker was reported as occurring in the Netherlands in 1925[10], and in Bulgaria in 1929[1]. It has not as yet made its appearance in Australia.

Symptoms.

The cankers vary greatly in size, and somewhat in appearance according to age. The young canker shows only as a small reddish discolouration of the bark. This increases in size and becomes more definite. As the cells die, the centre of the spot turns brown, but there is always a reddish-brown or purple margin which shows up against the green of the cane. The pycnidia appear as minute elevations before the centre of the spot becomes brown, and as they increase in size, small longitudinal slits appear in the bark exposing the black mass of spores beneath.

These slits are peculiarly characteristic, and in the field serve to distinguish this cankerous disease from Common Canker caused by *C. Fuckelii* Sacc.

The spots may be from one to several centimetres long, and may completely girdle the stem.

Etiology of the Disease.

Brand Canker is caused by *Coniothyrium Wernsdorffiae* Laub.

Morphology.

The mycelium on various culture media varies from greyish to black. Pycnidia are formed by close interweaving and anastomosing of numerous rapidly-growing hyphae in some intercellular space, at a point within the zone of the three outermost cell layers below the epidermis of the diseased area. As this tangled mass of primordium grows larger, the epidermis, together with the two or three underlying cell layers, becomes widely separated from the inner layers of the bark tissue. In the centre of the primordium a cavity is formed by the absorption of some of the hyphal cells.

By this lysigenous activity the cavity is gradually increased in area until it attains its characteristic size. In a mature pycnidium the cells lining the cavity are hyaline, thin walled and finely granular. These cells are sporogenous in function. Adjacent to these layers are several rows of larger cells devoid of granular cell contents and containing a brown pigmentation in the cell walls. These layers of cells form the enveloping wall of the pycnidium.

The pycnidial cavity may vary considerably in shape and the pycnidia are usually so closely grouped that they appear stromatic. The fungus is characterized by complex pluriloculate pycnidia rising from several confluent primordia. The pycnidia later open to the surface by papillate ostioles. Pycnidia are 400–600μ in diameter.

Spores are produced by budding from the innermost layer of cells lining the pycnidial cavity. The ovoid spore remains hyaline until it reaches its mature size, at which time pigmentation begins to appear. The spores are abstricted singly from the parent cells[12]. Laubert's measurements give the size of the spores 5 — 8 x 4.5 — 6μ. Waterman[12] gives them as 4 — 7.2 x 3 — 5.4μ.

No perfect stage of *Coniothyrium Wernsdorffiae* Laub., has been reported up to the present time.

Life History.

Given suitable conditions of moisture and temperature the pycnospores germinate and infect rose plants through abrasions on the stem, and through dormant buds. The fungus overwinters by the pycnospores contained in the pycnidia.

Control.

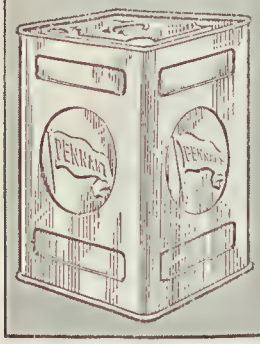
Laubert[7] recommends that diseased plants be cut back, and that roses be sprayed with Bordeaux mixture (4–4–50). Repeated applications should be made at intervals of two weeks throughout the summer.

Brand Canker Bibliography.

1. Atanasoff, D., and Kova evski, I. C.—Parasitic Fungi new to Bulgaria.—Bull. Soc., Bot., de Bulgarie, Sofia, iii., pp. 45-52, 1929.
2. Güssow, H. T.—Parasitic Rose Canker. A new disease in Roses.—Jour. Roy. Hort. Soc., 34, pp. 222-230, 1909.
3. Howitt, J. E.—Some notes on diseases new to Ontario (Abstract) Phytopath 15, p. 300, 1925.
4. Jenkins, A. E.—Brown Canker of the Rose.—Amer. Rose Ann., 1927, pp. 161-183 (Footnote on symptoms of Brand Canker by C. Westcott, p. 166).
5. Jenkins, A. E., and Martin, G. H.—Brand Canker of Rose appears in America—U.S. Dept. Agr., Off. Rec., 5 (25); 3, 1926.
6. Köck, G.—Ein für Osterreich neuer Rosenschädling-Ztschr. Landw. Versuchsw. Oesterr 8, pp. 660-666, 1905.
7. Laubert, R.—Eine neue Rosenkrankheit, verursacht durch den Pilze, *Coniothyrium Wernsdorffiae*—Arb. K. Biol, Aust. Land. u. Forstw. 4, pp. 458-460, 1905.
8. Laubert, R.—Die Verbreitung und Bedeutung der Brandflecken-krankheit der Rosen, und Ratschläge zur Bekämpfung der Krankheit.—Gartenwelt 11, pp. 332-334, 357-358, 378-380, 1907.
9. Martin, G. H.—Diseases of Forest and Shade Trees. Ornamental and miscellaneous Shrubs in the United States in 1924.—U.S. Dept. Agr. Bur., Plt. Indust. Plt. Dis. Reptr. Sup 42. p. 360, 1925.
10. Poeteren, N. van.—Verslag over de werkzaamheden van den plantenziekten-kundigen dienst in het Jaar, 1925.—Verslag. en Meded. Plantenziektenkund Dienst Wageningen 44, p. 124, 1925.
11. Waterman, A. M.—Rose Diseases: Their Causes and Control.—U.S. Dept. Agr. Farmers' Bull 1547, p. 20, 1928.
12. Waterman, A. M.—Diseases of Rose caused by species of Coniothyrium in the United States.—Jour. Ag. Res., vol. 40, No. 9, pp. 805-827, 1930.
13. Westcott, C.—An epiphytotic of Brand Canker of Roses caused by *Coniothyrium Wernsdorffiae* Laub.—U.S. Dept. Agr. Bur. Plt., Indust. Plt. Dis. Reptr. 10, pp. 38-40, 1926.

Is a simple arrangement that multiplies the power at the handle 260 times—handy to use, easy to move, quickly rigged, and works in roughest country. Standard equipment pulls trees and stumps from 1½ acres without changing anchor. Many other time and labour-saving features. Catalogue with pleasure.

TREWHELLA BROS. PTY. LTD., TRENTHAM



The Best You Can Buy!

Here are four products which are blended specially to render the highest service to the farmer. Each one is unexcelled for its specific purpose.

SHELL DEFIANCE BLOWFLY OIL: A valuable fly specific that prevents blowfly strike on treated sheep.

PENNANT KEROSENE: A pure lighting kerosene that provides a bright and unflickering light in lamps, and unvarying heat in incubators and brooders.

SHELL SHEEP-BRANDING OIL: An oil that resists the action of sun and rain but disappears completely in the scour. Obtainable in four distinctive colours---Red, Black, Blue and Yellow.

SHELL STOCK-MARKING PENCILS: Rapid, clean, effective and economical crayons for marking sheep, cattle, horses, pigs, etc. Obtainable in three colours ---Black, Red and Blue.

WRITE FOR FULL PARTICULARS.

PRODUCTS OF THE SHELL COMPANY LIMITED

MPG

SCIENTIFICALLY FITTED GLASSES ENSURE COMFORT

IF you are in doubt as to whether you require glasses or not you should have your eyes tested by an expert. The Optical Service our Clients enjoy ensures comfort in wearing glasses that fit accurately.

'Phone 6778 for an appointment

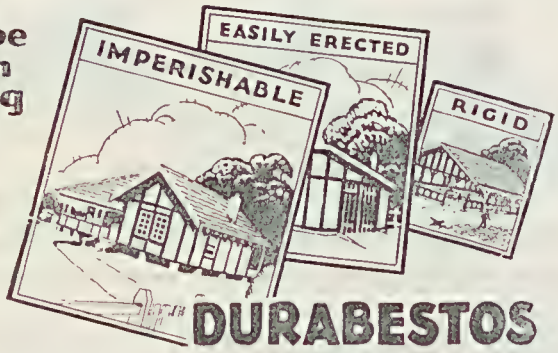
E. WOOD Pty. Ltd.

95 ELZABETH STREET
MELBOURNE

OPHTHALMIC OPTICIANS

Stevenson

For Every Type of Farm Building



DURABESTOS
FOR
COUNTRY BUILDINGS

For your new farm buildings or for repairs or renovations to those existing, make use of **"DURABESTOS" Asbestos Cement Building Sheets.** Durabestos, for that is the trade name of these sheets, is a modern building material made from Asbestos Fibre and Portland Cement. These are thoroughly united by mixture and by our exclusive process of compression into a dense and rigid product as hard as concrete and as smoothly surfaced.

Durabestos comes to you in many handy sizes, thus any job can be carried out without waste of material. It is easily nailed and fixed, and can be readily cut, if necessary. It is **fireproof** and weatherproof. Borers and White Ants cannot harm it, nor does it contain anything to decay or rot. Another big point in its favour is that Durabestos does not require painting for protection as is necessary with timber, nor does it need it for decorative purposes as its natural stone-grey colour and smooth finish are sufficiently attractive in themselves.

Durabestos is **Made in Victoria** at our factory at Sunshine, and the cement used in its manufacture is also made in Victoria. Thus, in using Durabestos in preference to imported wood linings, you are helping Australia as well as obtaining a material just as effective in its use, and you are a saver in this respect that Durabestos is available in sheets ranging from 3 feet to 12 feet by 3 feet and 4 feet wide, thus time and labour are saved in fixing, apart from the initial saving in cost. Imported T. & G. 6 inches by ½ inch lining is listed at 16s. 6d. per 100 feet lineal, equal to 33s. per 100 feet super. Durabestos $\frac{3}{16}$ inch thickness is priced at 2s. 8d. per square yard, equal to 29s. 8d. per 100 feet super. The big economy, though, in using Durabestos as against wood lining, is that, on account of its pleasing grey colour, Durabestos does not require painting.

Send for samples and literature direct to us or inquire from your local supplier of building materials

Wunderlich Limited

MANUFACTURERS

210 HANNA STREET, SOUTH MELBOURNE

Postal Address : Box 375 F, G.P.O., Melbourne. **Telephone : M 1261 (3 lines)**

The Fordson does an 8-horse job ... at lower cost

FORD CARS, TRUCKS AND TRACTORS ARE BRITISH EMPIRE PRODUCTS

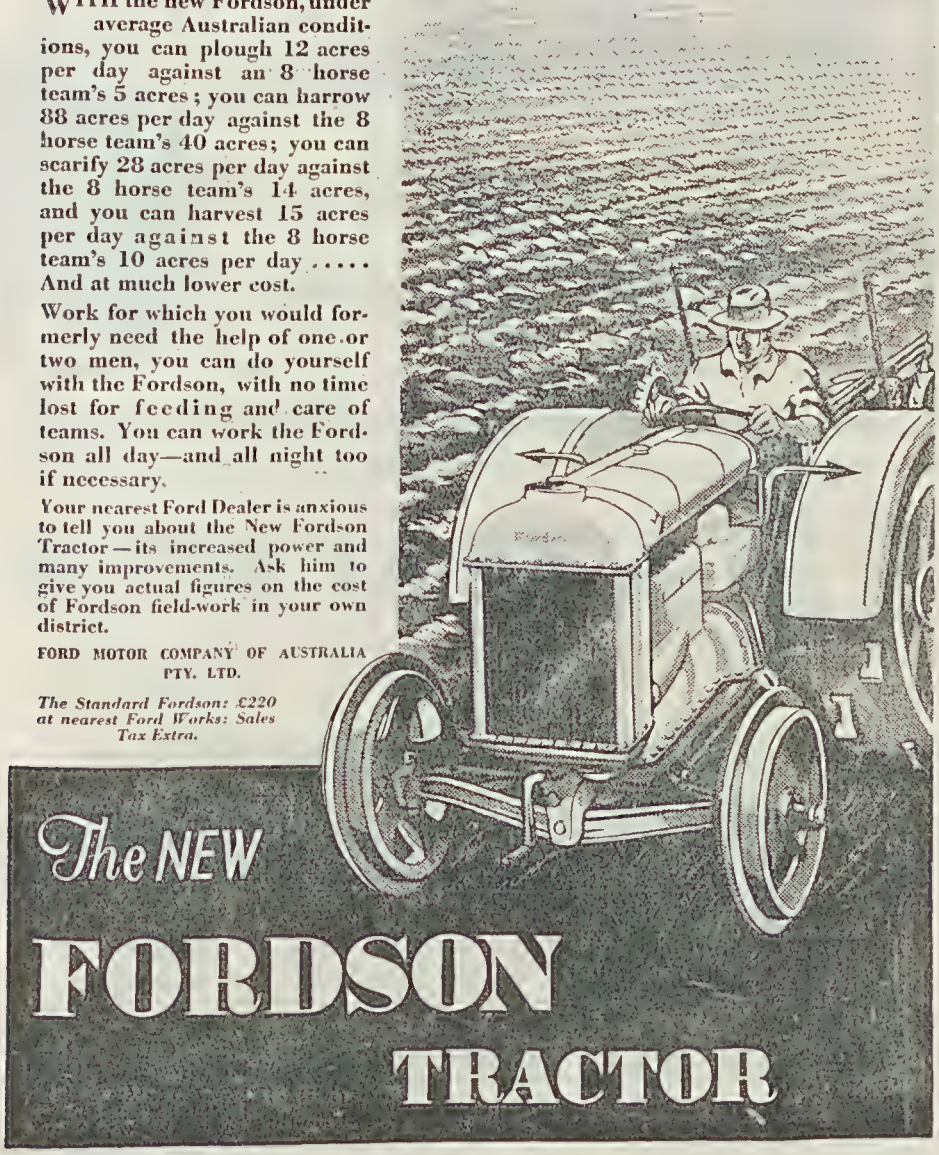
WITH the new Fordson, under average Australian conditions, you can plough 12 acres per day against an 8 horse team's 5 acres; you can harrow 88 acres per day against the 8 horse team's 40 acres; you can scarify 28 acres per day against the 8 horse team's 14 acres, and you can harvest 15 acres per day against the 8 horse team's 10 acres per day ..... And at much lower cost.

Work for which you would formerly need the help of one or two men, you can do yourself with the Fordson, with no time lost for feeding and care of teams. You can work the Fordson all day—and all night too if necessary.

Your nearest Ford Dealer is anxious to tell you about the New Fordson Tractor—its increased power and many improvements. Ask him to give you actual figures on the cost of Fordson field-work in your own district.

FORD MOTOR COMPANY OF AUSTRALIA PTY. LTD.

The Standard Fordson: £220 at nearest Ford Works: Sales Tax Extra.



The NEW FORDSON TRACTOR

PLAIN SPEAKING

"NOBODY forces a man to save," said one man to his friend. "If you don't save, nobody cares, nobody blames you in any way. You can go on wasting money as much as you like.

"But when you find yourself hopelessly on the rocks because you really need the money that you've wasted, and you begin to feel sorry for yourself, nobody cares very much then, either.

"The whole thing is up to you. It's up to you to look after yourself from first to last.

"A man should make a mighty effort to curb his self-indulgence, so that he can save money regularly. It will be hard, but you must do it."

A RESERVE FUND IN THIS BANK
IS CASH AT CALL EARNING FOUR
PER CENT. COMPOUND INTEREST

STATE SAVINGS BANK
OF VICTORIA

ALEX. COOCH, General Manager

LYSAGHT'S AUSTRALIAN MADE WIRE NETTING PROOF SYDNEY N.S.W.

LYSAGHT'S

100% AUSTRALIAN MADE 100%

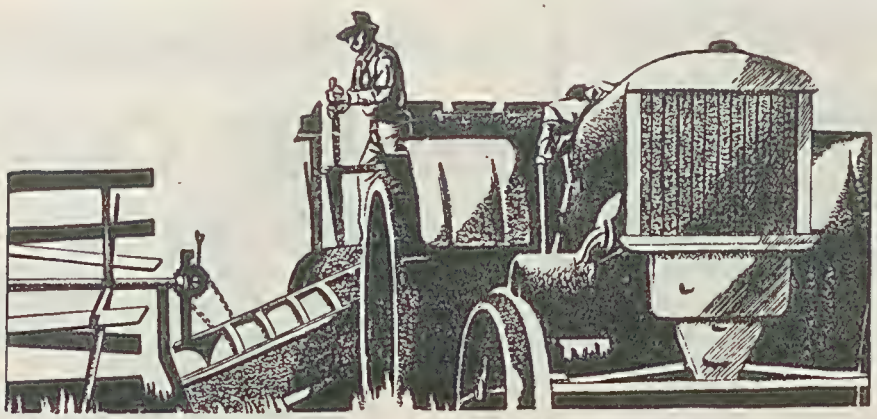
Fencing and Other Wires
Wire Netting Zinc Oxide

Our Netting and Other Products are known through the Commonwealth as of the highest standard. Obtainable from all leading Merchants and Storekeepers.

LYSAGHT BROS. & CO. LTD.

Head Office : 17-19 Bridge St., Sydney
Works : Parramatta River

Agents for Victoria :
Gibbs, Bright & Co., 34 Queen St., Melbourne



Texaco Super Power Kerosene —a Clean, Uniform Fuel

For your tractor and stationary engine, Texaco Super Power Kerosene can be depended upon to give you complete satisfaction. Always of the same high standard of quality—always clean and pure—Texaco vaporizes instantly and completely and leaves no harmful carbon.

Standardize on Texaco Super Power Kerosene now and reap the assured benefit of easier starting—maximum power, cleaner engine, and economy in operating costs.

Drive it with Texaco Super Power Kerosene—Save it with Texaco Tractor Oil.

THE TEXAS COMPANY (AUSTRALASIA) LIMITED
Branches in all States

TEXACO

SUPER POWER

KEROSENE

LAW, SOMNER'S OFFER SUBTERRANEAN CLOVER

THE CELEBRATED MT. BARKER, SOUTH AUSTRALIAN GROWN SEED
(CROP 1931) Guaranteed True and Passed by Dept. of Agriculture.
SPECIALLY RE-MACHINE CLEANED SEED.

No. 1 Quality .. 1/5 lb.
No. 2 Quality .. 1/3 lb.
less 1d. lb. on cwt. lots or more.

WIMMERA RYE GRASS

(From McDOUGALL'S STRAIN)
The True Purple-stemmed Variety.
7/- bushel

Western District Ryegrass—No. 1, Best, 8/6 lb.; No. 2, Prime, 8/- bushel.
N.Z. Ryegrass—7/6 bushel.
Cocksfoot—Danish, 1/- lb.; N.Z., 1/1 lb.; Vic. (with little Ryegrass), 11d. lb.
Clover, White Dutch—Best, 1/7 lb.; Prime, 1/6 lb.
Cowgrass—Giant N.Z., 1/3 lb.; 130/- cwt. Ordinary, 1/2 lb.; 120/- cwt.

Write for Special Price List.

LAW, SOMNER PTY. LTD.
The Oldest-established Seed House in Victoria
(Established over 81 years)
Block Place, Melbourne, C.1.

THE VICTORIA HERD OF

RED POLL CATTLE

Maintained for Milk and Beef at the State Research Farm, Werribee
is the
Largest Registered Herd-tested Red Poll Stud in the Commonwealth

5 BULL CALVES — **FOR SALE** — 5 BULL CALVES

All are progeny of tuberculin-tested stock, and of cows tested in the Standard Herd Test (A.299 N.Z.R.P.H.B.). All are eligible for Registration in the Red Poll Herd Book of Australasia.

1. *Born* .. 26th October, 1930
Sire .. Victoria Major Royal (817 AA)
Dam Victoria Avesta (1142 AA)
21 Guineas

2. *Born* .. 24th March, 1931
Sire .. Victoria Major Royal
Dam .. Victoria Village Belle (1522 AA)
20 Guineas

3. *Born* .. 24th December, 1930
Sire Dominion Bright Belgian
Dam Victoria Guilder (2430 B)
20 Guineas

4. *Born* .. 30th December, 1930
Sire .. Earl of Beaconsfield (35 AA)
Dam Victoria Velbit (2341 A)
17 Guineas

5. *Born* .. 11th February, 1931
Sire Dominion Bright Belgian
Dam ... Victoria Euphrates (716 A)
24 Guineas

The prices quoted are based on the butter-fat production of the dam at the rate of 1/- per lb.

Inspection cordially invited. For further particulars apply to—

Dr. S. S. Cameron, Director of Agriculture, Melbourne, C.2
or The Manager, State Research Farm, Werribee

NATIONAL TRUSTEES

Executors & Agency Company of Australasia Ltd.

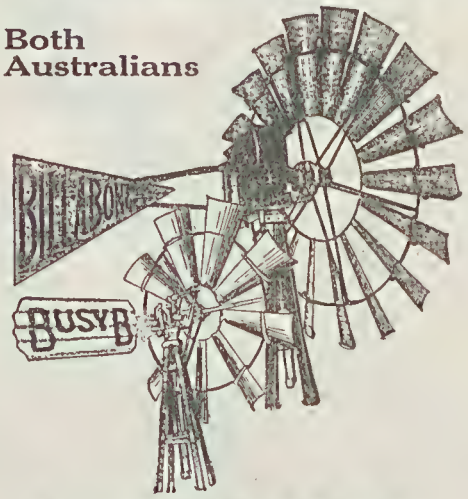
DIRECTORS:
EDWARD FITZGERALD, Esq., LL.D., Chairman.
JOHN J. WINTER-IRVING, Esq. CHAS. R. MURPHY, Esq.
JOHN S. FEEHAN, Esq. EDWARD RYAN, Esq., M.B. et Ch.B.

This Company Acts as Executor or Joint Executor of Wills, Administrator, Trustee of Settlements, and Agent for Absentees under Power of Attorney.

Offices—113 Queen Street (Corner of Little Collins St.), Melbourne
CHAS. CROMIE, Manager.

Billabong & Busy-B Windmills

Both Australians



Billabong Pumping Plants owe their superiority to more than 50 years of manufacturing experience. They fully comply with the needs of the Australian Farmer.

Expert opinion is that the Billabong stands FIRST among Encased-Gear Windmills. Its complete Cast Iron Casement keeps out rain and dust, and forms a perfect oil well for Gears, &c., and provides for perfect lubrication.

The Busy-B (a 5-ft. Mill) meets the demand for a small Mill to pump water for uses about the homestead. Design is simple and workmanship quite up to the Billabong standard. The price, complete with attachment for fixing to wood post, is £7/-/-

Windmill Catalogue Post Free on application

Bore Casing and Pipes and Fittings for Irrigation at Lowest Prices

JOHN DANKS & SON PTY. LTD.

391-403 BOURKE STREET, MELBOURNE, C.1
324-330 PITT STREET, SYDNEY

IDEAS FOR YOUR WILL

The main points are—

1. To appoint a permanent and reliable Executor
2. To provide for your wife and family—
   (*a*) Income to your wife
   (*b*) Capital to your children
3. To give general instructions to your Executor

Write or call for our Booklet *"The Making of a Will"*

THE Trustees Executors & Agency Co. Ltd.

(THE PIONEER TRUSTEE COMPANY OF AUSTRALIA)
412 Collins Street, Melbourne, C. 1

The disease trouble lately experienced by poultry keepers has been attributed to contamination gathered from stale foods—bought cheaply, perhaps, but not having been subjected to thorough sterilization, fermentation may have occurred, with disastrous results.

"Dandy" Poultry Food

Is *Thoroughly* Sterilized

"Dandy" Poultry Food is scientifically prepared from healthy flesh and bone of animals fit for human consumption—pure and wholesome in every ingredient, and KEPT WHOLESOME because of the thorough and rigid sterilization of every particle before it is packed.

There's no risk of disease amongst YOUR birds if you give them "Dandy" Food in proportion of 10 per cent. to 12 per cent. with other food—but an improving of their health, "condition," laying capacity, and flesh weight.

"Dandy" is a real stamina supplier also, building up "layers" against the constant strain of egg production, revitalizing breeders, and the best of all foods for growing chicks.

Start with "Dandy" AT ONCE

Analysis—Protein, 60 %; Fat, 7 %; Moisture, 10 %; Mineral Ash, 23 %.

Obtainable Grocers and Produce Merchants

Supplied in 25-lb. and 100-lb. Bags and in 1-ton lots.

If any difficulty in obtaining, write or 'phone direct to

Gippsland Co-operative Bacon Curing Co. Ltd.

Registered Office and Factory:
DANDENONG. Box 42. 'Phone 44.
City Depot: 58-60 King St, Melb. 'Phone Cent. 3649

Packers of the Famous "Dandy" Hams & Bacon

Govt. Expert Testifies to its Value

WEDNESDAY, 6th MAY, 1931
At 12 o'clock sharp

Great Sale of the High-producing Pure and Grade Type and Utility

Hazeldale Jersey Herd

(All Certified)

Banyule, Melrose, Werribee Park, and Glen Iris Blood

120—HEAD—120
At JINDIVICK

ADAMSON, STRETTLE & CO. PTY. LTD., 482 Bourke Street, and THE GIPPSLAND & NORTHERN CO-OPERATIVE CO. LTD., Warragul, have received instructions from Mr. A. J. Maplestone to sell on above date his high-class selected Pure and Grade Jersey Herd, on the property, "Hazeldale," Jindivick, 8 miles North from Drouin Railway Station.

1930 Govt. Herd Test—
19 cows and heifers averaged 457·71 lb. butter-fat
1928/29 Ass. Test—
62 cows and heifers averaged 341·34 lb. butter-fat
1929/30 Ass. Test—
65 cows and heifers averaged 339·90 lb. butter-fat

The Stud Cattle have all been served by Werribee Planet (Reg.) (bred by Mr. Geo. Chirnside) and the Grades are in calf to Dinkum of Banyule (1924).

The majority of the Herd have a double cross of **The Ideal Dairy Sire**, Dinkum of Banyule (1924), which had **several tours** on the **Better Farming Train**, for demonstration purposes, throughout Victoria. His tested daughters produced up to 527 lb. butter-fat; 35 Certificates; averaged 377 lb. butter-fat. This record included 11 2-year old heifers.

SAVE MONEY, and purchase "Hazeldale" High-producing Pure and Grade Jerseys Audrey's Lord Twylish (985) blood predominates

Motorists take the Prince's Highway, turning North at The Old Robin Hood Hotel before reaching Drouin, thence 6 miles to Jindivick.

NOTE.—Please bring Catalogues to the sale, which may be had on application to the Selling Agents.

This Journal

offers exceptional advantages

for Advertising

Rates on application to the Official Canvasser

DEPARTMENT OF AGRICULTURE
MELBOURNE, C. 2

PASTURE VARIETIES

Special Values

Scientifically tested and re-cleaned for Purity, 100 % Growth; true to type; and passed by Department of Agriculture. When cash accompanies order, packing is free (no charge for sacks).

G. & N. GRASSES

Sow 1¼ to 1½ bushels per acre. 20 lb. supplied per bushel.

RYE GRASSES—
Western District, "A" Grade, saved off old pastures, and most suitable for a permanent pasture sowing .. .. 9/– bus.
Wimmera, best quality, selected seed .. 8/– bus.
Wimmera, good quality, machine-dressed 7/– bus.
English Perennial, standard quality .. 8/– bus.
N.Z.-grown English Perennial, standard quality .. .. 7/6 bus.

COCKFOOT—
N.Z. "Akaroa" grown (best) .. 1/1 lb.
Standard quality .. .. .. 1/– lb.
Best Imported Seed .. .. .. 1/– lb.
Victorian grown (re-cleaned) 11d. lb.

PRAIRIE GRASS—
New Zealand grown, excellent germination .. .. 12/6 bus.

CHEWING'S } 1/6 lb.
FESCUE }

G. & N. CLOVERS

Sow mixed, 4 to 6 lb. per acre. Alone, sow 10 to 15 lb. per acre.

Subterranean, re-cleaned (Special), excellent value .. 1/6 lb.
½-cwt. lots .. .. 1/5 lb.
Cwt. lots and over .. 1/4 lb.
Subterranean, standard quality 1/4 lb.
½-cwt. lots .. .. 1/3 lb.
1-cwt. lots .. .. 1/2 lb.
Giant Colonial Cowgrass (Perennial Red Clover) .. 1/3 lb.
½-cwt. lots and over 130/–cwt.
Imported Cowgrass, English or Continental grown .. 1/2 lb.
½-cwt lots and over 120/–cwt.
English Wild White, N.Z. grown 2/6 lb.
Strawberry (shelled) ,, ,, 7/6 lb.

SPECIAL QUOTES for LARGER LOTS
Send also for Free 1931 Seed Guide, and Free Seed Samples.

GIPPSLAND & NORTHERN CO.-OP. CO. LTD.
Seed Dept. : 492-4 Flinders Lane, Melbourne, C. 1

DEPARTMENT OF AGRICULTURE

POULTRY FOR SETTLERS

ORDERS FOR COCKERELS for delivery from March may now be booked from the Poultry Pens at the Central Research Farm, Werribee
Settings of Eggs can be supplied in season
1st July to 1st October orders are booked in rotation

WHITE LEGHORNS

No. 1—Pure Cosh World's Record Strain.
„ 2—From Single Tested Hens with scores of 260 to 285 eggs, Single Mated to Cocks bred from Hens with scores of 275 to 301 eggs.

UTILITY BLACK ORPINGTONS

(Founded on Christie and Cullen Strains)

No. 1—From Single Tested Hens with scores of 256 to 284 mated to Cockerels bred from Hens with scores of 272 to 313 eggs.
„ 2—From Hens bred from above mated to Cockerels bred from Single Matings.

For prices and particulars apply to The Manager, Research Farm, Werribee

Pasture Grasses! Fodder Crops!

Are you thinking of them now?

YATES can help YOU, and will be pleased to consult with you at any time regarding Pastures and Pasture Improvement and Fodder and Grazing Crops, and with special reference to the most suitable varieties for your particular district.

Sheep on N.S.W. Tablelands pastured on a mixture of Perennial Rye Grass and Red Clover

Those interested are invited to write for Catalogues and Booklets dealing with Re-machined and Tested Farm Seeds, Pasture Grasses and Clovers, also Vegetable Seeds, Flower Seeds, Bulbs, Plants, Trees, Fertilizers, &c.

ARTHUR YATES & COMPANY LTD.

BOX 2707 C, G.P.O., SYDNEY

Warehouse and Retail Dept.:

184 SUSSEX STREET, SYDNEY

Associated Seed Farms and Trial Grounds in New South Wales, Tasmania, New Zealand, and England

By Authority: H. J. GREEN, Government Printer, Melbourne.

Publications Obtainable from Department of Agriculture.

JOURNAL OF THE DEPARTMENT OF AGRICULTURE. 64 pp. Illustrated.

The Journal is issued monthly, and deals with all phases of up-to-date agriculture. The subscription, which is payable in advance and includes postage, is 3s. per annum for the Commonwealth and New Zealand, and 5s. for the United Kingdom and foreign countries. Single copy, 3d. New Volume commences with the January number of each year.

A limited number of the issues comprising Volumes XXI. (1923) to date are at present in stock, and will be supplied at the foregoing rates. A few bound copies of Volumes from IX. (1911) to date are at present available, except Volumes XVI. (1918), XVII. (1919), XVIII. (1920), XIX. (1921), XX. (1922), and XXIV. (1926). Price, 5s. per Volume. *Postage:* C., 7d.; other places, 1s. 9d.

MILK CHARTS (Monthly and Weekly), 1s. per dozen, post free. Large Cabinet Charts, 2s. per dozen. When ordering, dairy farmers should mention "Monthly," or "Weekly," or "Cabinet."

BEE-KEEPING IN VICTORIA. (Cloth Cover.) By F. R. Beuhne. 2s. *Postage:* C., 3d.; other places, 7d.

HONEY FLORA OF VICTORIA. By F. R. Beuhne. 1s. 6d. *Postage:* C., 2d.; other places, 4d.

By Professor A. J. Ewart, Government Botanist.

PLANTS INDIGENOUS TO VICTORIA. Vol. II., 10s. *Postage:* C., 6d.; other places, 1s. 4d.

By C. French, F.E.S., Government Entomologist.

DESTRUCTIVE INSECTS OF VICTORIA. Parts I., II., IV., V., 2s. 6d. each. Part III. (slightly damaged), 2s. each. *Postage:* C., 3d. each; other places, 9d. each.

(Note:— A very limited supply only of Part I. is available).

By D. McAlpine, Government Vegetable Pathologist.

RUSTS OF AUSTRALIA. 5s. *Postage:* C., 6d.; other places, 1s. 4d.

SMUTS OF AUSTRALIA. 4s. *Postage:* C., 5d.; other places, 1s. 6d.

FUNGUS DISEASES OF STONE FRUIT TREES IN AUSTRALIA. 2s. 6d. *Postage:* C., 4d.; other places, 10d.

FUNGUS DISEASES OF CITRUS TREES IN AUSTRALIA. 2s. *Postage:* C., 2d.; other places, 6d.

SYSTEMATIC ARRANGEMENT OF AUSTRALIAN FUNGI. 3s. *Postage:* C., 6d.; other places, 1s. 4d.

HANDBOOK OF FUNGUS DISEASES OF THE POTATO IN AUSTRALIA AND THEIR TREATMENT. 1s.* *Postage:* C., 6d.; other places, 1s. 4d.

* Price reduced from 5s.

By J. Farrell, Orchard Supervisor.

APPLE CULTURE IN VICTORIA. Cloth Bound, 3s. 6d., Paper Covers, 2s. 6d., *Postage:* C., 3d.; other places, 9d.

Works on Viticulture.

(Translated from the French by R. Dubois and W. Percy Wilkinson.)

FIRST STEPS IN AMPELOGRAPHY. By Marcel Mazade. Cloth, 1s. Paper, 6d. *Postage:* C., 2d.; other places, 4d.

TRENCHING AND SUB-SOILING FOR AMERICAN VINES. Paper, 9d. *Postage.* C., 2d.; other places, 6d.

NEW METHODS OF GRAFTING AND BUDDING AS APPLIED TO RECONSTITUTION WITH AMERICAN VINES. Paper, 6d. *Postage:* C., 2d.; other places, 3d.

AMERICAN VINES: THEIR ADAPTATION, CULTURE, GRAFTING, AND PROPAGATION. By P. Viala and L. Ravaz. Cloth, 2s. *Postage:* C., 4d.; other places, 11d.

STUDIES ON WINE-STERILIZING MACHINES. By U. Gayon. Paper, 9d. *Postage:* C., 2d.; other places, 4d.

State Research Farm, Werribee

SELECT BRED SEED WHEAT

DEPARTMENT OF AGRICULTURE
VICTORIA

THE Department of Agriculture has for sale limited quantities of Select-bred, Graded Seed Wheat grown at the Central Research Farm, Werribee, and the State Farm, Rutherglen. Supplies of Free Gallipoli and Ranee have been exhausted, and as only small quantities of the other varieties are available early application is advised.

The varieties available at Werribee are :—

SEPOY
RAJAH
GHURKA
MOGUL

Price, 3s. 6d. bushel free on rails, Werribee

Rutherglen varieties are :—

GHURKA
FEDERATION

Price, 3s. 6d. bushel free on rails, Rutherglen

Palestine Oats and Pryor Barley also are available at Werribee

Prices—Oats, 2s. 6d. bushel ; Barley, 3s. bushel ; free on rails, Werribee

Orders for Seed should be forwarded to

THE DIRECTOR OF AGRICULTURE
DEPARTMENT OF AGRICULTURE, MELBOURNE, C. 2

SP
630.5
V645